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For three years after the record-breaking success of *Batman*, legions of batfans eagerly awaited the return of their Dark Knight. With *Batman Returns*, director Tim Burton — in his inimitably macabre style — was to once again bring the Batman legend to the screen. Like the first film, which had been a monumental production mounted in England, *Batman Returns* would demand the all-out efforts of a veritable army of filmmaking and effects personnel. For the sequel, the filmmakers would remain on American soil, shooting the live-action on some of the biggest soundstages in Hollywood — with no fewer than eight effects facilities joining the fray. Visual effects supervisor Michael Fink oversaw the complex effects assignment, which included everything from Gotham City miniatures to animatronic penguin puppets to computer generated bats. Key contributors to the project were to come from the celebrated ranks of Boss Film Studios, Matte World, Stetson Visual Services, The Chandler Group, Video Image Associates, Stan Winston Studio, 4-Ward Productions and CG Special Effects. *Article by Mark Cotta Vaz.*

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COVER — The Penguin prepares to engage the Caped Crusader in *Batman Returns*. (Photograph by Jack Pedota.)

Effects Scene: Technology And Magic

article by james Cameron

At the Los Angeles Convention Center on October 25th of last year, the Society of Motion Picture and Television Engineers hosted an all-day tutorial on the subject of "Issues in Advanced Motion Imaging." A veritable 'who's who' of effects luminaries was assembled to address the convocation on the accelerating integration of digital technologies into film and video production. Invited to open the proceedings was writer-producer-director James Cameron whose blockbuster hit, Terminator 2, had recently served notice on the film industry that digital technology was here to stay.

It's an honor to be invited to give the keynote address to such a distinguished group. And it's interesting that of all the speakers in today's lineup they should choose the least qualified to kick things off. You're going to have Dennis Muren and Richard Edlund, among others, coming up here to give us all a glimpse of the future. These guys were revolutionizing special effects with a little project called *Star Wars* while I was still driving a truck for a school district in Orange County. The moral of the story is that I'm here to learn, to hear what these and the other wizards have to say, as much as you are. So since I can't dazzle anyone with science, I'll segue smoothly into the 'baffle 'em with bullshit' part of the address.

I'm assuming the audience here is a combination of film and video people. I'll probably use the word 'filmmakers' throughout this address. I mean that in a very general sense, as people who create images, motion images for narrative purposes; but just for simplification, I'll call them filmmakers because I *am* one and that's kind of how I relate to the situation. I'm assuming the audience is also composed of kind of wizard 'wannabes' who are actually going to try to do this stuff for a living on the one hand, and on the other hand the end users, some filmmakers or videomakers who need to know how to use these new tools and techniques for fun and profit. The problem, of course, is that even though these two groups are locked into a forced symbiosis in which neither side could really survive without the other, for the most part the members of the one camp tend to not know jack shit about what the members of the other camp actually do.

Now, we all want the same thing. We have these images in our minds, and we want to get them onto the screen. And, of course, we want to do it as cheaply as possible. The challenge is twofold. The wizards have to create the hardware and the software to realize the images; and the clients, the storytellers, have to come up with ideas worthy of these new techniques. Then the two have to work together to make it happen. The only way this really works is if each one knows a bit about what the other does — which a symposium like this goes a long way toward doing. If computer graphics are being integrated into live-action photography, the animators have to have a pretty intimate knowledge of how plates are shot and, even more importantly, what the real-world, living-hell realities of daily production are really like. On the other hand, it's incumbent on directors and producers to stay abreast of what the technology can offer *them*. I think there's a widespread attitude among filmmakers that: "Hey, I'm a creative person. I know script, I know performance, I

work with actors. I don't want to have to have an engineering degree to do what I do." And yet these same people are daily practitioners in a technological medium, whether they like it or not.

One of the questions I'm most often asked by journalists is some form of this: "Is it possible as a director to balance all this technical complexity on the one hand with the human side of filmmaking?" — or some such phrasing. The answer, of course, is that if the film works, then the balance has been possible. But what the journalist is really trying to do is make a case that the two are mutually exclusive opposites. They think the directors who come from technical backgrounds spend too much time and creative energy on the image, whether it's set design, special effects, heavy stunts or action. The implication is that you can't walk and chew gum, that you can't hold all that tech stuff in your head *and* the human story, the emotions, the characters, et cetera; and so, therefore, the actors will flounder in a freezing black void and give shitty performances. They always use the term 'human' to describe the dialectical opposite of the technical. They tend to treat technology as if it's something removed from the human condition. They forget that humans are the only technological species. They forget that we live in an age where our very existence is defined in its every detail by our interaction with technology.

Our fate as a species, our very survival, will depend on our mastery of technology — or its mastery of us. These are themes that I explore in my films — but also behind the camera, as well. Yet many filmmakers are influenced by the so-called 'humanistic' mentality of the critics to the extent that they wear their technical ignorance like a badge. They actually believe that it would hurt them artistically to know more about the technology available to them — and they therefore limit themselves, because only through mastery of all the tools for image-making can the mind and the imagination truly soar free. And creation in the real world of what the mind imagines is the greatest expression of our humanity.

This is the great schizophrenia of filmmaking — balancing the palette of technical tools with the emotional and narrative goals of the film. It's a kind of left-brain/right-brain dichotomy. I guess that's why we have both hemispheres — most of us.

As a film director, my job is to be a generalist — a jack of all trades and a master of none. I accept the responsibility of knowing what tools are available to me, but I don't stay up all night reading technical manuals. It is only necessary that I have a good sense of what is possible and am able to articulate my needs to the people who are actually going to do the work. This applies to the dolly grip operating the dolly or to a computer animator sitting at his screen. In the area of computer and digital imaging, I would be the first to admit that my knowledge is cursory and general — and yet it's enough to accomplish my ends. When I was in college, I used to tear down and rebuild all my motorcycles and car engines. At a certain point, smog controls, electronic ignitions, fuel injection, all of that stuff, made it too complex and I haven't turned a wrench since. But I still drive a car. I use the new technology on a daily basis. I get what I need out of it.

I believe special effects practitioners should treat their clients like racecar drivers. They should respect the client's skill behind the wheel without expecting him to know how to rebuild the engine. Conversely, the driver — the filmmaker or the videomaker — should learn as much as he needs to know to get the fastest lap time out of the car. He needs to be able to communicate with

his pit crew, tell them what's going on. The problem is that the technical landscape is changing rapidly and it's hard to know what is possible and what is impossible anymore.

I certainly didn't know when I went into T2 what we were actually going to be able to accomplish. Things had changed so rapidly. Even though my prior experience on *The Abyss* had brought me into direct contact with computer graphics, I didn't know how far the techniques had advanced in the meantime. So right now, the technical gulf has never been wider than it is between effects people and filmmakers. The explosion of techniques in the last decade alone is dizzying, and the curve seems to be exponential. You effects guys know too much. You're getting like doctors — too much knowledge and not enough bedside manner. I can't wait for the first special effects malpractice suits to hit the courts.

Arthur Clarke had a theorem which stated that any sufficiently advanced technology is indistinguishable from magic. And that's how it's supposed to be — for the audience. We want them to think it's magic. It's dangerous when we, the filmmakers, start to think it's magic. In an age where the only limitations to what we can create will be imagination and money, too few filmmakers feel confident to even propose their dreams.

The wizards have to do two things. First of all, they have to reach out to the filmmaker and explain very clearly what can be done, what the cost will be and what the danger areas are. Show examples of the techniques you're proposing. Be clear about the filmmaker's responsibilities up front. Who's doing the design? Who's shooting the plates? Are there potential hidden costs or overages? *Be honest*. Don't low-ball the bid and then jack up the cost later — the client won't come back. The second thing the wizards have to do is demystify effects techniques. Take the fear factor out of bluescreen, computer graphics, digital composite work, digital wire removal, 2-D image processing, process in general, all of these tools, by taking the bullshit out of the language for the filmmaker. I've seen effects people dithering around on a bluescreen shoot like a bunch of high priests at a virgin sacrifice — they piss me off. I've seen others — like Dennis Muren's team from ILM — come onto my set, they get their plate without a lot of mumbo jumbo and they leave. I manage to integrate their work into my daily schedule just like it was any one of the setups I had to do that day.

These techniques are all just tools. They should be treated with respect, but not fear. They should be understood so they can be used well. When I wrote *The Abyss*, I visualized a tentacle probe made from sea-water that communicated with humans by taking on their forms, their faces. A little voice in the back of my mind said that this image was only possible with computer animation, even at



James Cameron realized his creative vision in The Abyss and Terminator 2 by calling upon Industrial Light and Magic to provide cutting-edge computer graphics representations of a benign extraterrestrial water probe and a liquid metal killing machine.



James Cameron realized his creative vision in The Abyss and Terminator 2 by calling upon Industrial Light and Magic to provide cutting-edge computer graphics representations of a benign extraterrestrial water probe and a liquid metal killing machine.

the stage that I was writing it. However, with the finished script in hand, I found myself wearing my other hat, my producer/director hat. Now the voice was screeching: “Computer graphics! Are you out of your mind?! That stuff costs a fortune. It takes years. Never looks right. All the guys doing it are liars trying to pay for their equipment.”

At the time, most of the previous love affairs between films and computer imagery had produced questionable results. Fortunately, CG was just then at the cusp of respectability, with years of hard work finally coming to fruition. Several companies were able to produce compelling tests which convinced me to go that route. The one thing that I remember is that no two companies proposed the same solutions to a given problem. This was a bit daunting to me, because I was a neophyte; but it suggested to me that there were myriads of software tools being created with overlapping sets of capabilities and a lot of untested potential. That made it exciting. We were going to be blazing a trail.

The computer animation department at ILM under Dennis’ supervision created exactly what I had seen in my mind’s eye. It was an arduous nine-month process; but at the end of it, I realized that it was an almost crystalline, perfect act of pure creation. From the imagination to the screen with no physical intermediate — no models. It was like the Krell dream of pure creation. The audience response to the sequence was overwhelming. They got the joke; they understood intuitively what was magical about the scene. They were seeing something which was impossible, and yet looked completely photorealistic. It defied their power to explain how it was being done and returned them to a childlike state of pure entertainment. The sufficiently advanced technology had become magic to them.

This was intoxicating, so Dennis and I wanted to do it again. Now, when I created the T-1000 for *Terminator 2* — when I thought of the idea of that — I was really dancing with the devil, because the dramatic success or failure of what was already going to be a really expensive project hinged on the completion of a large number of cutting-edge effects shots in a short period of time. We set out to do more than three times the number of shots we had done on *The Abyss* in less time — in less than the nine months that we’d had on *The Abyss*. And the kicker was that much of the necessary software was untested, and some had not even been written.

It was scary; it was risky; it was probably stupid — but there was so much enthusiasm and confidence from the animators. I could tell that collectively they knew we were on the verge of something and that it could be done. I felt this from all the companies that bid on the shots. It was in the air; it was a wave waiting to be caught and ridden. At the same time, I knew that *they* were waiting for me, or someone else, to come along with a project big enough to justify the dough spent on R-and-D and to push the film applications of CG techniques to the next level.

So we went ahead with it. It was planned like a military operation, and ILM actually did the shots on time and on budget. It’s been reported in the press differently, but that’s not the case. It was actually the Impossible Dream realized. Groundbreaking work was done within sound business parameters — which is really, aside from the imagery and the creative goals of the animators, one of the primary goals, I think, of computer graphics since it started, is to make it something that you can dial in to a project with known parameters.

Regardless of what one may think of the film, it seems to me that this marks a kind of a benchmark for CG — a maturing of digital imagery into a user-friendly tool for filmmakers. In addition, some excellent digital composite work was done by PDI — Pacific Data Images — and also 4-Ward Productions. Bob and Dennis Skotak used CG to create the blast wave destroying downtown Los Angeles, which is, I think, one of the most memorable shots in the film. I think the hypocenter was actually this building.

The audience response has obviously been all that we'd hoped for; and I think, as a result, more filmmakers will be encouraged to go for it, to let their imaginations run wild — which is important for everybody in this room, because those who don't ride the edge of the wave in entertainment technology are going to get left behind.

PROFILE: KATHERINE KEAN

article by Jody Duncan

Among the women who have carved a niche for themselves in the male-dominated effects industry is Katherine Kean, cofounder of Available Light — a company which has earned a solid reputation for high-caliber animation effects.

It was with a strong background in art, and just a bit of naivete, that Kean first sought work in the field. “I didn’t realize that being a woman would make any difference, but in a way it has. I think it’s a little harder to get taken seriously; and there’s a tendency not to give women certain ‘masculine’ jobs. No one wants a woman animating bullets, for example.”

Born in Huntington, West Virginia, in 1956, Kean grew up in New England and attended the Rhode Island School of Design. Although she began her studies in the fine arts department, she was eventually drawn to the film department and, specifically, animation. “I had always tried, in my paintings, to get the feeling of movement. So animation was a natural progression from that.”

After graduating in 1978, Kean spent six months working on a variety of projects ranging from an animated children’s show to illustrating album covers. Seeking more film opportunities, she moved to Los Angeles in 1979 and began knocking on doors. “Basically, nothing happened. I wound up in the art department of a publishing company for a few months, then quit to work on my own paintings.” Months — and several addresses — later, Kean finally received a call from Video Concept Engineering, one of the numerous companies she had solicited upon her arrival in Los Angeles. “They called every number where I had lived, and the people at each different address forwarded them on until they finally got me. I accepted the job immediately, figuring it would only last a couple of months.” Kean’s prediction proved wrong. She remained at VCE for more than two years, advancing from basic rotoscoping to animation in films such as *Dragonslayer*.

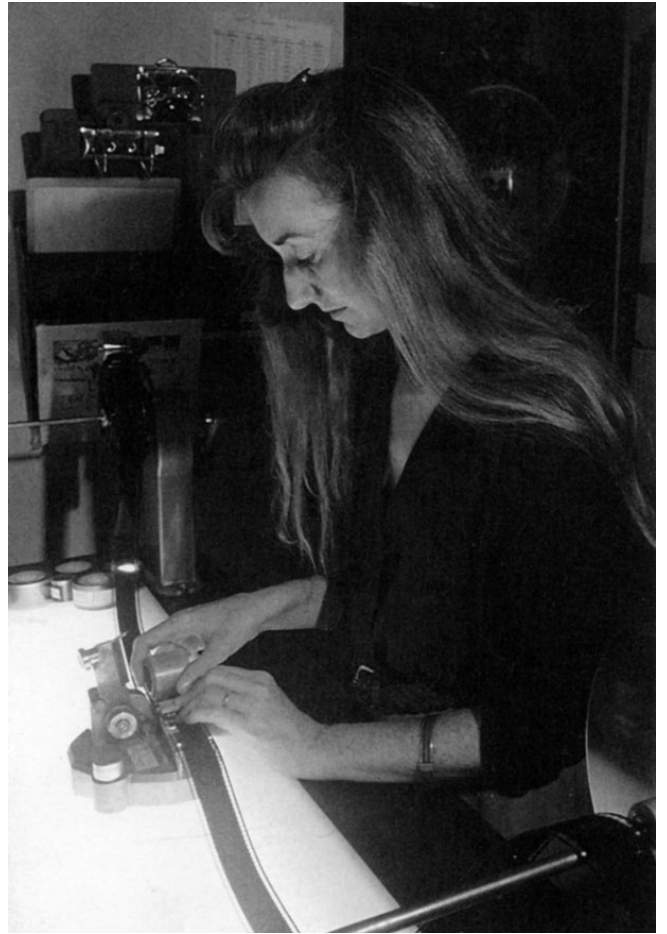
While at VCE, Kean first met John Van Vliet, then an animator at Industrial Light and Magic. Compatible both professionally and personally, the two decided to branch out on their own, forming Available Light in 1983. “We started with almost no capital,” Kean recalled. “We rented office space in North Hollywood and bought an animation camera, which was our only major investment.” With only this limited equipment — and their inherent talent — Kean and Van Vliet launched their new enterprise with a flourish. “We literally started the company one day and got work the next. The first thing we did was for a television pilot called *Automan*; then, shortly after that, we worked on *Deal of the Century*. We were doing a lot of handmade animation — just the two of us — hiring extra free-lance help when we needed it. We went very quickly from one office to two. Then, within six months, we doubled again. The company just kept growing until, after about three years, we moved to our present location.”

The work continued to pour in, virtually nonstop, as Available Light won choice assignments on such films as *The Golden Child*, *Willow* and *Who Framed Roger Rabbit*. The unceasing schedule was so tight, in fact, that the couple just managed to squeeze their 1984 marriage into a few days’ break between projects. Their honeymoon had to wait until two years later. Despite career demands,

however, the partnership has prospered. “I think John and I were particularly well-suited to combining our work and our personal lives. We met through work and then had the wonderful experience of starting this company together. Our professional roles have evolved somewhat through the years. When we first started, there was just the two of us; so we both did everything. Eventually it became apparent that we had different strengths, so we began breaking things up that way. My strengths are fire and smoke and pixie dust kinds of things. John is good at everything, but he is especially strong with lightning. We both do good explosions — we fight over those. As the company has grown, we’ve also learned that I’m a little better at the business side of things; so I’ve taken on more and more of that.”

That ‘business side of things’ is considerable, as Available Light now employs between seven and fifteen full-time people, depending on the workload. For Kean, one of the rewards of success is that she now enjoys more creative input into the filmmaking process. “We have, over the years, become much more involved with preproduction, rather than just coming in at postproduction. We get called in on jobs before they start shooting — sometimes even before they start casting — because we bring a very strong visual sense to the work. Film people appreciate our contribution to design.”

Although still very much involved in the company’s current projects — among them *Honey, I Blew Up the Kid* and *Dracula* — Kean has recently lightened her workload at Available Light. Coming full circle, in a sense, she has returned to painting. “After working so hard for so many years, I thought the time was right for me to step out of things a little bit. I do my painting outside, out in nature; so it is very different from working inside in the dark, as I’ve been doing for so long. Going back to painting was something I felt I had to do for myself — and it’s going very well.”



Effects animator Katherine Kean in the editing room at Available Light.

QUICK CUTS: DATING THE BABE

article by Lois I. Burgner

In 1932, during a game in Chicago's Wrigley Field, spectators witnessed one of the most famous moments in baseball history — Babe Ruth's 'called shot' home run. On that landmark day, Ruth pointed toward center field and, on the next pitch, smacked the longest home run ever hit in the park, straight over the center field wall. Because of its notoriety, it was imperative that the moment be faithfully reproduced for Universal Pictures' cinematic ode to the baseball giant, *The Babe*.

Unfortunately for the filmmakers, only the legendary George Herman Ruth himself could have made that hit. Although actor John Goodman had, through weeks of practice, mastered the fundamentals of batting and pitching, the natural right-hander could not duplicate the power and precision of the celebrated southpaw. Complicating the reenactment even more was the fact that Wrigley Field — and all of the baseball parks featured in the film — had changed considerably in the past sixty years. Some, in fact, no longer existed. Also problematic were the literally thousands of fans needed to fill the stands for the game sequences — an expensive proposition that would have necessitated the hiring of some twenty thousand extras dressed in period costume. Faced with these logistical problems, Universal approved a visual effects budget for *The Babe* and hired Chuck Comisky to supervise the effort. "Initially," said Comisky, "filling the stadiums with fans was the focus of the effects assignment. Obviously, to try and get ten or twenty thousand dress extras, even on a budget the size of *The Babe's*, was prohibitive."

The film's live-action game sequences were filmed — appropriately — in Wrigley Field and at a minor league ballpark in Danville, Illinois. To create the dated stadium backgrounds, Comisky turned to both traditional and relatively new matte painting techniques. Traditional matte paintings simulating Yankee Stadium and Forbes Field in the 1920s were created by Bill Taylor and Syd Dutton of Illusion Arts, then composited with live-action plates of the game. For the foreground crowd in the stands, Comisky had supervised the filming of Vistavision plates with approximately one thousand extras in period costume — footage which was composited into the paintings. The distant grandstands were filled by projecting moire patterns into the artwork to create a general sense of movement.

Although the Illusion Arts matte paintings were beautifully executed, Comisky had determined early in the project that digital technology would be required to transform modern-day Wrigley Field and Danville Stadium into Depression-era ballparks. To that end, Comisky commissioned Pacific Data Images to add tiers to the stadiums, remove architectural structures and turn one thousand extras into a crowd of twenty thousand. "We can do things that just can't be done with regular matte painting," commented PDI project supervisor Les Dittert. "We can do three-dimensional matte paintings, almost as if we were painting on glass shapes. It liberates the matte artist from having to paint on a flat plane."

Computer generated mattes paintings, designed by Comisky, comprise nearly two-thirds of the matte shots in the film. Plates of the foreground and infield live-action were photographed with a

standard four-perf camera, then scanned into PDI's computers for digital alteration and enhancement. For the called shot sequence, Comisky had photographed a plate of John Goodman at Wrigley Field. "The problem," said Comisky, "was that Wrigley Field in 1932 didn't have high-rise buildings behind it, and the outfield grandstand didn't look anything like it does today." Comisky provided PDI with old photographs to use as guides in computer generating the historic ballpark.



To recreate Babe Ruth's celebrated 'called shot' home run for The Babe, effects supervisor Chuck Comisky engaged Pacific Data Images to restore Wrigley Field to its vintage 1932 appearance by digitally removing modern-day bleachers and scoreboard, plus two high-rise buildings in the distance.

"We scanned in the photographs and used them for reference," explained Dittert. "We used the photographs almost like overlays, flipping back and forth and constructing the matte painting version underneath with the computer paint program." The anachronistic high-rises were also removed digitally.

To recreate some of the older, grander ballparks, PDI had to add levels to some existing structures. To duplicate 1935 Forbes Field, for example, animators 'cloned' the lower tier of the Danville Stadium and positioned it above the field's current top level.

Computer generated ramps and facings were created to knit the two levels together. In another application of the technique, PDI extended Danville's right field and stretched the contemporary stands to replicate New York's Polo Grounds, which was torn down many years ago. "We actually scanned in a picture of the Polo Grounds circa 1925," said Comisky, "and created the wraparound end of the stadium."

The next step was to fill the grandstands. Comisky filmed one thousand extras dressed in period costume, positioning them up in different key sections of a stadium. PDI scanned these plates and then duplicated them, up to twenty elements per shot, cutting and pasting the sections like a



With only a thousand costumed extras on hand, Comisky had them move from section to section in the stands so that PDI could later extract them from the film footage and merge them into a stadium-size crowd.

jigsaw puzzle. “When we got the plates scanned into the computer,” Dittert explained, “we made mattes and basically rubber-stamped the crowd throughout our matte painting of the stadium. We time-slipped the different plates so that people wouldn’t be moving the same way at the same time. Anywhere we needed a group, we could just draw another matte and drag in five hundred or a thousand people and stick them in there. By doing that, we were able to create the illusion of a very crowded stadium with a lot of excited cheering people, all dressed in period costume.”

Another shot where PDI extended the crowd was at the end of the film, where Ruth walks into a tunnel — and into history. “We had to extend the crowd out over the tunnel,” stated Dittert, “because it actually stopped right at the tunnel entrance. That was another one where we copied the audience over. In that shot, the audience is very big in the frame — you can actually identify people in it. There is a soft, zigzag seam going down through the audience, but you can’t really see it.”

In addition to the stadium shots, Comisky tasked PDI with creating computer generated baseballs. The balls were modeled in the computer and then animated and composited into live-action plates, allowing Comisky to dictate the dynamics and trajectories of the flying balls — without having to rely on the batting or pitching abilities of actors. “There were shots where the ball was going over a fence,” said Dittert, “an out-of-the-ballpark-type of thing. Comisky shot the live-action without the ball and then we added the computer generated ball into the scene. Most of the shots were just streaks across the sky. We studied the amount of motion blur that would be required for a certain speed, and put that motion blur into our shots. There was one shot where a pitcher throws the ball directly toward the camera — you actually see it up close. So we had to model the ball quite accurately, with seams and everything.”

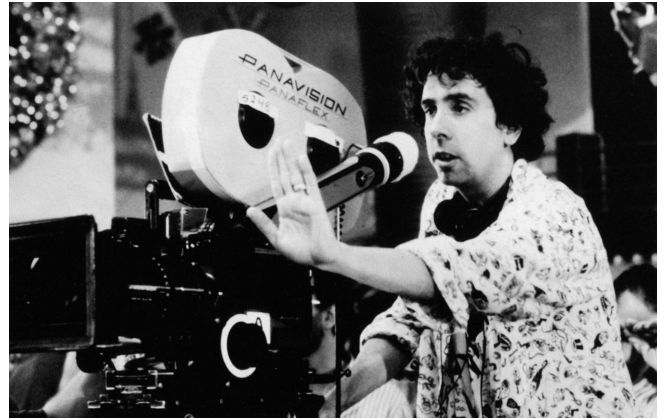
Computer generated baseballs were also required for a sequence in which Ruth is pitching. Although Goodman had learned to bat left-handed with conviction, the naturally right-handed actor found it difficult to duplicate Ruth’s speed and precision on the mound. Comisky suggested that Goodman simulate pitching, without the ball. “I asked John just to wind up and heave an imaginary ball in there as best he could — which looked terrific — and we’d add the ball in later.” Unfortunately, the batter and catcher in the same shot underestimated the speed of the imaginary ball. “They waited about ten frames too long to react,” noted Dittert, “so it looked like a very slow pitch. To solve that problem, we put a soft matte around the catcher and the batter and time-shifted them ten frames earlier. We couldn’t just take the frames out because the audience and other things in the scene would have jumped. Then we added a ball that was motion-blurred and color-corrected for the background. It looked like John was really smoking the ball right in there.”

Chuck Comisky designed more than thirty effects shots for *The Babe* — shots that are so seamlessly blended into the film by PDI and Illusion Arts that most audience members are unaware of their existence. Coming off that success, Comisky is most enthusiastic about the prospects for integrating digital technology with traditional matte painting techniques. “The possibilities for combining traditional matte art with computer generated imagery are very exciting. The two techniques are not in opposition to each other — in fact, I think there is the potential for a perfect marriage.”

A KNIGHT AT THE ZOO

article by
Mark Cotta Vaz

image



Having won a modest cult following with Pee-wee's Big Adventure and Beetlejuice, director Tim Burton was suddenly thrust into the media limelight with the release of Batman. As boxoffice returns soared, the anonymity of the former Disney animator, heralded as a cinematic visionary, diminished. Fans and studio executives alike were eager for the filmmaker to repeat his stellar performance. But Burton, waiting for the Batman din to quiet, allowed three years to pass before stepping up to bat once again with Batman Returns.



The sequel would feature not one, but two of the DC Comics classic villains — the Penguin (Danny DeVito) and the Catwoman (Michelle Pfeiffer). Noting a lack of well-grounded character development in the comic book incarnations, Burton determined to explore the psychological origins of the characters' twisted sensibilities.

He sits alone in the empty, moonlit mansion, waiting for the vision. Through the window it comes, a shaft of signal light illuminating the room with the black bat silhouette. Thus is millionaire Bruce Wayne — secretly the masked *Batman* — called to defend Gotham City from its latest crisis in Warner Brothers' *Batman Returns*.

The film had been anticipated ever since 1989's *Batman*, released on the fiftieth anniversary of the enigmatic comic book character's debut. Connecting the generations who had read the pulpish adventures during *World War II* to the Sixties children who had watched the pop television show incarnation to the Eighties kids who reveled in the *Dark Knight* visions of the comic book graphic novels, *Batman* had been nothing less than a moviemaking phenomenon, putting up the kind of home run stats that Hollywood dreams are made of: the first film to break the \$100 million mark in its first ten days of domestic release; almost half a billion dollars in international boxoffice; the sixth highest-grossing movie ever; the most successful film in the long history of Warner Brothers.

With that kind of wind at the sails, a sequel would normally have been a done deal. But that was not accounting for the view of director Tim Burton, who not only had serious reservations about a sequel but also harbored ambivalent feelings toward the first film. "There were parts of *Batman* that I liked," Burton admitted, "but I thought it was a little boring. I didn't feel as close to the movie as I had to my other films. I have a love for a certain kind of funky effects, which worked for me on films like *Pee-wee's Big Adventure* and *Beetlejuice*. If there is such a thing as fine art and folk art in effects, I'm into more of the folk art look. I decided to take that same kind of attack in *Batman*; but in my own mind, it didn't work."

While Burton's work previous to *Batman* had been produced with a degree of anonymity and resulted in sleeper boxoffice hits, the director, by his own admission, had not been prepared for the fishbowl in which he would find himself while bringing to life the saga of the masked guardian of fabled Gotham City. The mere announcement that Michael Keaton had been cast in the role of the



Returning in the role of Batman was Michael Keaton, whose controlled and enigmatic performance in the first film had stilled the outcry from wary fans who had initially rejected the offbeat casting.

Dark Knight of Gotham resulted in some fifty thousand outraged letters from comics fans, with even the esteemed *Wall Street Journal* covering the furor. Still reeling somewhat from the media blitz surrounding the first film, Burton had not considered a return to Gotham City until the completion of his 1990 release, *Edward Scissorhands*. It was after that film that Burton and his team were ready to roll up their shirtsleeves, take a hard look at a sequel, and go to work. The grueling six months of principal photography, which began in September 1991, would also include a frenetic postproduction period, with new effects shots being devised weeks before the June 19 national release.

For *Batman Returns*, the production's game plan was to look at *Batman* afresh — 'sequel' was a dirty word. Michael Keaton would return as a *Batman* outfitted in a sleeker, armor-plated costume rather than the rippling musculature of the original batsuit. Along for the ride would be the *Dark Knight's* classic foes — the Penguin (Danny DeVito) and *Catwoman* (Michelle Pfeiffer), as well as a new nemesis, the scheming mogul Max Shreck (Christopher Walken). A change of venue for the production was also favored. Primarily to escape the Hollywood hoopla of the first film, Burton had chosen Pinewood Studios, outside London, to house the original *Batman* production. To bring *Batman's* world to life a second time, Burton opted to work on the Warner Brothers' Burbank soundstages. The famed Gotham back-lot set created at Pinewood was dismantled, and the two batmobile prototypes — in storage in England since the wrap of the first film — were called home.

Starting fresh also meant rebuilding *Batman's* world from scratch — and with Burton forsaking location shooting in favor of set work, the production promised from the start to be effects intensive. "At first, a project like this is almost incomprehensible," production designer Bo Welch commented. "It was one of the first scripts I had ever read that I couldn't hold all in my head, no matter how many times I read it. The guidelines were the same as they'd been on the first film: the hero is a dark, neurotic character who dresses up in a rubber batsuit and saves his town. But the sheer volume of events that had to happen — generally through a combination of in-camera and visual effects — was nearly impossible to comprehend. The schedule also demanded that we begin work on the effects unusually fast. Normally you get your sets going and then begin to develop the effects; but we had to do it all simultaneously."

Overseeing the awesome effects assignment was visual effects supervisor Michael Fink. "When we started the picture," Fink said, "we had approximately ninety shots, which because of budget and schedule concerns was reduced to about seventy-eight shots within the first month of principal photography. When principal wrapped at the end of February, effects shots started to be added until we ended up with about one hundred fifteen." The additional shots ranged from a new miniature title sequence to an end shot devised to explain the fate of the *Catwoman*. Digital wire removals would also be required to eradicate any telltale signs of the work of physical effects supervisor Chuck Gaspar and his CG Special Effects crew.

The effects workload, which included matte paintings, miniatures, computer graphics, makeup effects, puppets and pyrotechnics, would require a full roster of effects houses. "It was pretty clear from the start that, given the scale and schedule of the picture, we would have to break the effects work up among different houses," Fink noted. When the dust from the bidding process finally settled, Fink found himself the conduit between six major effects outfits, their subcontractors and

the production offices at Dictel — the tongue-in-cheek, corporate-sounding name selected by Burton for his production company.

Batman Returns would leap into the dark, macabre mood of *Batman*'s world with a prologue and title sequence introducing the Penguin. It is Christmastime in Gotham and the weather is cold, bleak and biting. Inside Cobblepot Mansion, a husband and wife debate the fate of their gruesome, birdlike baby. Finally, they pack their little bundle of nightmares into a black baby carriage, trundle off into the night to a bridge in the old, abandoned Gotham Zoo — and toss carriage and infant into the icy waters leading down into the city sewer system.

The prologue would involve in-camera miniature and matte painting effects created by Matte World, a company formed by alumni of the Industrial Light and Magic matte department. “The shots we created for *Batman Returns* were specifically of interest to us because they’re well suited to the approaches we like to take,” explained Matte World visual effects cosupervisor Craig Barron. “We love in-camera work combining miniatures and matte paintings. We don’t have to worry about shooting different elements independently of each other, with the inevitable recomposites to fix the matte lines.”

Cobblepot Mansion — a Matte World miniature — would be filmed with the camera eye floating in wintry fog and sleet through a wrought-iron gate laced with grillwork and up to the sinister silhouette of the Penguin’s father framed behind a window. Dubbed the ‘*Citizen Kane*’ shot (in homage to that film’s opening tracking shot over the sprawling grounds of Charles Foster Kane’s Xanadu), the effect would combine separate gate and mansion models, photographic effects to create aerial perspective, and a rear projection plate of a silhouetted figure in the window — with Matte World cameraman Wade Childress’ teenage daughter serving as photo double for Cobblepot, played elsewhere by Paul Reubens.

To build Cobblepot Mansion, as well as Wayne Manor and other models on their *Batman Returns* agenda, Matte World brought in John Goodson and Howie Weed of Renegade Effects, a longtime Matte World collaborator. The demands of the opening shot required that the mansion be built as a three-sided, twelfth-scale model. Goodson and Weed built the model out of a high-density construction board to effect the venerable, rock-solid look of the old house. “For most of the details we used materials you



The opening sequence begins with a long tracking move toward moody Cobblepot Mansion, the birthplace of the deformed, birdlike Baby Cobblepot — soon to be known as the Penguin. Matte World produced the multiplane shot utilizing both miniatures and rear projection techniques to create a sense of depth and scale.



In the shot the camera continues past the gate towards the window where the grim master of the house stands in silhouette. An illusion of distance was achieved by photographing the gate and mansion models on separate but overlapping motion control tracks with the Cobblepot figure rear projected into the window.

can find at hobby shops,” Goodson said, “trim and molding and so forth. We used vacuform bricks and roof texture to detail the roof and the face of the building. We sculpted some of the architectural detail out of clay so we could take a mold off it and cast up parts.” Among the details were some winged cherubs that adorned the iron gate of Cobblepot mansion. “We started to research where we could find some cherub figures that already existed to help the sculpture along,” Weed explained. “I was going past the garden section of a local department store and found some cherubs that were the right scale for the gate model — they were even in the exact pose required by the production! We did some modifications on them, basically chopping off the arms and repositioning them, adding some two-part epoxy to fill the sculpture out a little bit, and stippling them with an acrylic compound so they looked like they were carved out of stone.”

Another detail that went into constructing the gothic gateway of Cobblepot Mansion was the use of a photo-etched metal cast from a drawing executed by John Goodson’s brother, David. “David first drew a wrought-iron gate with some elaborate scroll work around the word ‘Cobblepot,’” Goodson explained. “We then went to a company called Insight Designs and they took the artwork and photographically transferred it to sheets of brass. Then they acid-etched away everything that wasn’t exposed. What we got back was a phenomenal amount of detail that would take forever to do by hand.”

Both the gate and mansion models were placed on their sides on separate, but overlapping motion control tracks for filming. The rigging would allow the foreground gate to pass under the camera lens, moving faster toward camera than the mansion model to force the illusion of depth. “The tricky part of shooting the mansion was having a foreground object like the gate,” motion control camera operator Cameron Noble noted. “When we were booming up, we wanted the gate to drop down in frame at a rate that didn’t make the perspective shift look too odd. We had the gate traveling on its own track towards the camera as the camera traveled towards the model; so the gate approached us much faster than the building behind it — giving the impression that the model was a lot further away.”

Falling snow effects were accomplished as three separate passes exposed on the same piece of film. “Most of the time, snow is just optically added over the top of a scene,” Barron noted. “That looks fine for static shots; but in shots that have movement you want to have the snow moving through the scene with the camera. All the separate, layered passes were photographed with the same motion control move, so that the mid-ground layer that was in focus became more and more out of focus as we moved past and through it. We also came up with a technique of adding haze to suggest that there was a mass of air between the lens and the mansion at the start of the move; so as we moved in to the window, there was more contrast in the miniature’s lighting.”

A process projector was placed behind the camera to project snow onto a white four-by-eight-foot foamcore sheet that was positioned between the mansion and the gate. “We used the same projector, but moved the foamcore screen to three different positions for the different snow exposure passes,” explained Barron. “Once the motion control camera got into the black area between the snowflakes, we just stopped it, took that card out and allowed the camera to move through where the card had been. The first pass was up front and close so that it was out of focus; the second pass was midground snow in focus falling behind the gate; and the final pass went out past the model for the effect of background snow falling through the sky.”

In the scene where the Cobblepots skulk past the old zoo with their demented baby, a Matte World painting of the park and the city skyscrapers beyond was filmed with a live-action rear projection plate of the Cobblepots. Artist Bill Mather worked on two four-by-eight sheets of masonite, creating a final eight-by-eight-foot painting. The surface, painted with the kind of fast-drying acrylic paint often used for animation cel backgrounds, incorporated a rear projection window where Mather would match the spidery, dead branches of zoo trees the Cobblepots passed in the live-action plate.

The look of both the zoo and Gotham City background had been meticulously planned to ensure the painting would match up with the overall design of the movie. “Basically, we approach all our shots by first doing eight-by-ten-inch production paintings that go through an approval and art direction process,” Barron said. “These production paintings establish the composition and lighting of each shot. For the background buildings of Gotham City we were trying to create the look of New York — the tops of the buildings going up through haze and lighting up the sky. The scene was similar to New York’s Central Park, with a wall of buildings behind the park area. Often we’d relate what we were doing to New York — Gotham City is basically a gothic fabrication of New York gone wild.”

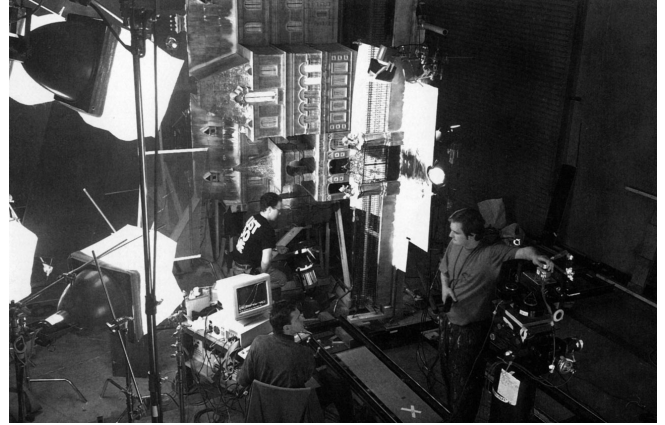
Since the old zoo featured a variety of odd pavilions which would be revealed in a later miniature flyover shot providing a bird’s-eye view of the grounds, the logistics of the zoo painting were of particular concern. “The relationship of the zoo pavilions was planned down to such details as entrances from the north gate or south gate,” Mather noted. “There was some leeway in painting the pavilions because you don’t really know what angle you’re coming into for this particular shot. Because we wanted to showcase the zoo and Gotham City and the live-action we had to come up with an arrangement of elements that would allow all those things to read in the shot.”

A tilt-down move and a vaseline filter moved in front of the camera helped to wash out the background buildings and provide depth. “The vaseline filter is helpful in that it can selectively mush areas,” said Barron. “We had the buildings appear to be sticking through cloud tops, as if the building lights were setting off this glow as they pierced through the clouds.”

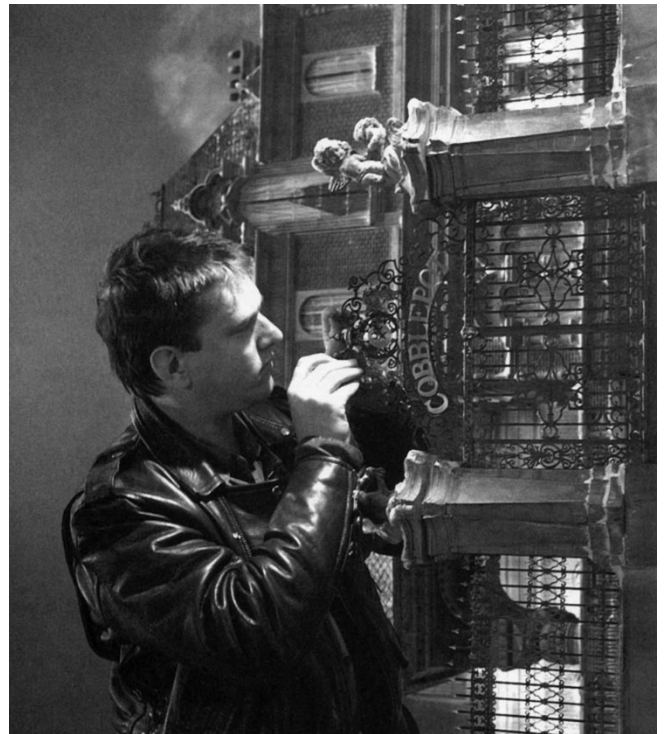
Subtle movement was incorporated to provide a grounded sense of reality. “I’ve noticed through the years that motion control moves tend to look a little too computerized,” Noble revealed. “Live-action camera operators will sometimes ride their pan and tilt a little bit even after they’re done with a shot. So I like to program in those little inaccuracies to make it look a bit less like a motion control camera operator is handling it. It’s very subtle — as you pan down and stop, it is programmed to creep up a little bit. If a motion control shot is too clean it almost draws attention to itself. Rather than paying attention to what you’re panning and tilting on, you notice the jarring stop of a camera’s movement. It’s better to keep the camera moving a little bit all the time to make everything more active.”

4-Ward Productions would pick up the title sequence for the baby carriage’s journey through the Gotham sewers under the old zoo to the cavernous, underground stadium of the park’s abandoned Arctic World attraction. The company, whose recent work included staging in miniature the nuclear destruction of Los Angeles for *Terminator 2*, would create the sequence in-camera using both full-scale and miniature carriages. The long sequence would allow 4-Ward to carry the art-directed

effect through a series of slow shots in the sewer tunnels, as opposed to the quick cuts of most effects assignments.



Built by Renegade Effects, the mansion and gate miniatures were mounted on their sides to facilitate the tracking moves. On stage at Matte World, camera assistant Rich McKay, motion control cameraman Cameron Noble and effects supervisor Craig Barron prepare for filming.



Noble makes adjustments to the Cobblepot gate. Elaborate detail on the model was achieved by photographically transferring intricate gate artwork to sheets of brass. When the unexposed areas of brass were etched away with acid, nothing but the wrought-iron grillwork remained.

The philosophy of the sequence was literally a descent into the underworld and a perverse twist on biblical legend. “One of the things the production wanted to parallel, strangely enough, was the story of Moses floating through the reeds,” explained 4-Ward visual effects supervisor Robert Skotak. “The motif was of this baby carriage floating downstream deeper and deeper into these catacombs and tunnels under Gotham City, with shadow play suggesting cathedral windows and gothic doorway shapes, before ultimately coming to rest in the Arctic World lair below the old zoo. This sequence of shots was to give a very sinister and foreboding feeling, implying almost a religious conversion or baptism of this being into the underworld. So among the things we initially talked about was what kind of naturally occurring elements could we have in the shots that would suggest, for example, reeds in the water, such as protruding tips of rusted rebar. Every cut was methodically thought out in terms of running time and camera motion. The sequence required a continuous sense of movement from right to left as we followed the carriage through. At the very end, the carriage enters into the lair where the live-action picks up.”

Originally consisting of only one shot of the carriage washing down a cascade of sewer water into the tunnel, the title sequence was one of the major additions to the effects schedule after the wrap of principal photography. Like most of the effects sequences in the film, the title sequence was first worked out in video “We created video storyboards,” stated Mike Fink, “developing the moves on video first and showing them to Tim. We did the whole show that way — I would work with storyboard artists Marty Kline and Michael Jackson to come up with a sequence to show Tim for approval or modification.”

Miniature tunnels the production company had built for a batskiboat chase in a climactic sequence in the film were reemployed for the expanded title sequence. The tunnels, which had been built at a length of one hundred twenty feet to accommodate the high-speed batskiboat model shots, were reconfigured by 4-Ward for use with both a full-scale and miniature carriage. “The carriage was black and very sinister with a big belt around it suggesting something very nasty strapped inside,” stated Skotak. “The basket weave design was made out of S’getti, similar to copper insulated wire sleeve that was interlaced by hand over a plexiglass body. The tunnels would have been an average of thirty-two feet across in real life; our miniature tunnels were eight feet across, and not quite eight feet high. We only built two-thirds of the full round — the bottoms were flat and filled with about nine inches of water. The tunnel surfaces were covered by vacuformed brick patterns and dressed out with moss and miniature ladders by our model team, which included Chandler Group, Pat Denver, Doug Moore and Ricc Ruskuski. The tunnels were mainly constructed of a square-stock steel that was welded together with bendboard attached as a basic undersurface. We spray-foamed all the cracks and also sealed the entire base of this tunnel to keep it watertight. Our matte artist,



Horried by their bizarre offspring, the Cobblepots take a midnight stroll to the abandoned zoo grounds where they throw the baby, carriage and all, off a bridge and into the city’s sewer system. A live-action plate of the desperate couple pushing the black carriage was incorporated into a matte painting of the old zoo grounds backed by the towers of Gotham City. Lining up to the trees in the rear projected plate, artist Bill Mather painstakingly extends the tree branches in his matte painting.

Rick Rische handled most of the painting of the tunnels and dressings initially. For the title sequence, our model team did most of the repainting themselves.”

Special lighting schemes highlighted the black carriage as it floated along the murky, labyrinthine tunnels. “For the first shot in the sequence,” stated Skotak, “we had an arm that boomed out over the camera that had three or four little reflectorized halogen lights aimed into the water, creating a lot of specular highlights in and around the black shape of the carriage. In this shot, there was a little bit of reflection coming off the water onto the texture of the basket weave of the carriage, which was enough to separate it from the dark water. As the carriage went away, we craned down until it became silhouetted against the lightness of the distant background.” Since there was to be a background plate for the opening titles — with a flock of bats against the *Batman Returns* title — the carriage sequence was shot in Vistavision to accommodate the compositing of computer graphics bats created by Video Image Associates.

A key shot along the carriage’s methodical journey was the ‘baptism’ shot of the carriage floating toward camera through a waterfall. Instead of the miniature carriage, this shot utilized a full-sized one. “If we were really close to the carriage and it was very large in frame or coming directly at us, we found it was easier to work with the full-scale carriage,” explained Skotak. “If the shots were big and wide, we used the scale model.” Modifications on the miniature tunnels were made so that they could be used with the full-size carriage. “We reworked the detailing on the miniature tunnel to create a larger brick pattern. For the baptism shot, the full-scale carriage was on a track; for all the shots, the carriage was either pulled along on a little sled by cables, or mounted on an underwater track. They also wanted a sheeting effect with the water, so we slit the top of the set and poured water from overhead onto a piece of sheet metal to spread it out. To add character to the splashing water, we shot it at forty-eight frames per second. The entire job was really an art direction challenge, as opposed to a heavy-duty visual effects challenge. The real concern was mood, tone, texture, issues of separating foreground from background and the right pacing of the movement to work with what we understood would be a very atmospheric score.”

A tricky shot involved the baby carriage flashing a shadow on the sewer wall that fleetingly takes the form of a penguin silhouette. “There was the question of how far to go with that, whether to make the shadow look literally like a penguin or just a subliminal suggestion,” said Skotak. “The idea is not that this shadow magically converts into a penguin; it’s just a happenstance of distortion across a convoluted surface that leaves a feeling of magic. To create the effect, we had our head modeler, Jim Towler, sculpt a three-dimensional shape which had the carriage on one side and a penguin shape on the other. As we rotated it slightly, the shadow would shift and morph from the carriage shape into the penguin shape. We could literally spin it around and play with different speeds of rotation of the sculpture and create an interesting interplay on the wall; because, of course, the more bumpy the wall, the more stretching and distortion would occur to the shadow. We could hide the transition of this rotation very subtly; so it was very much logic-driven, as if the shapes of the wall were causing it. The final choice was to keep the shape subliminal. The shadow of the carriage passes through a smooth area momentarily and it forms up into this bulbous shape with a beak on it and it then rocks back and forth and reverts back to the carriage shape. It’s noticeable, but you almost have a sense of seeing it after you saw it, leaving a little question in your mind.” As the carriage washes up in the ruins of Arctic World, it is met by elder penguins who, in a

twist on the story of baby *Tarzan* being raised by the apes, nurture the deformed birdman to maturity.

All underworld villains covet the shining city; but the adult Penguin has to settle for dark and desperate Gotham. In the spirit of pulp fiction and Warner Brothers gangster films, Gotham is a concrete jungle where criminals dictate from the business end of a gun. One of the memorable achievements of the 1989 film had been the menacing ambience of Gotham City, which successfully captured that noir look. Production designer Anton Furst, who won an Academy Award for his *Batman* work, helped craft that city of fear which, essentially, laid the foundation that Burton and Bo Welch would build upon for *Batman Returns*. Furst, who had embarked on other projects after the 1989 film, including design work for New York's Planet Hollywood movie-theme restaurant, died in November 1991 in an apparent suicide leap from a Los Angeles parking garage.

The return trip to Gotham would continue the theme of a perverse City of Tomorrow — a hellish tangle of skyscrapers erupting skyward, blocking out sun and sky and leaving the citizens below trapped in a claustrophobic zone of steel and concrete — but provide Burton and company the opportunity to prowl along some new avenues. “What they built for the first movie was formal and serious,” Welch observed. “This set is a little more American — it has a lot more wit and irony. The look of the city is influenced by sort of Fascist World's Fair architecture mixed with generic American urban decay and a sprinkling of our more contemporary, profane mixed zoning.”

The visual centerpiece of Gotham City — and the film itself — would be the downtown shopping district of Gotham Plaza, constructed on Stage 16 at Warner Brothers, one of the biggest soundstages in Hollywood. While the first *Batman* movie had the luxury of outdoor space — a quarter-of-a-mile of Pinewood backlot on which to build a main street and Gotham Square — the new downtown, despite the expansive soundstage, would require perspective tricks to fit in all the buildings illustrated on the production drawing board.

Gotham Plaza would ultimately rise as a city cast from the Burton mold, a cartoon come to life, full of expressionistic structural surfaces and distinctive iconography. In front of the town square was a government building out of an Orwellian fever dream, dominated by two gigantic statues of muscular male figures straining to pull back mechanical levers. At the opposite end of the plaza was a new Gotham cathedral with unabashedly cartoonish figures carved into its exterior: a mummy,



Initially, the title sequence was to end with a simple shot of the baby carriage disappearing into the sewer. After principal photography wrapped, however, the sequence was extended considerably to include the camera following the carriage as it moved deeper and deeper into the tunnels and, finally, to the underground ruins of the Arctic World attraction at the abandoned zoo.



4-Ward Productions shot the sequence in miniature tunnels built originally for a later sequence in the film. Crew members prepare a setup in the quarter-scale tunnel set. While most of the sequence was filmed in miniature, certain shots required the use of a full-scale carriage, with the walls of the tunnel redressed to reflect the larger scale.

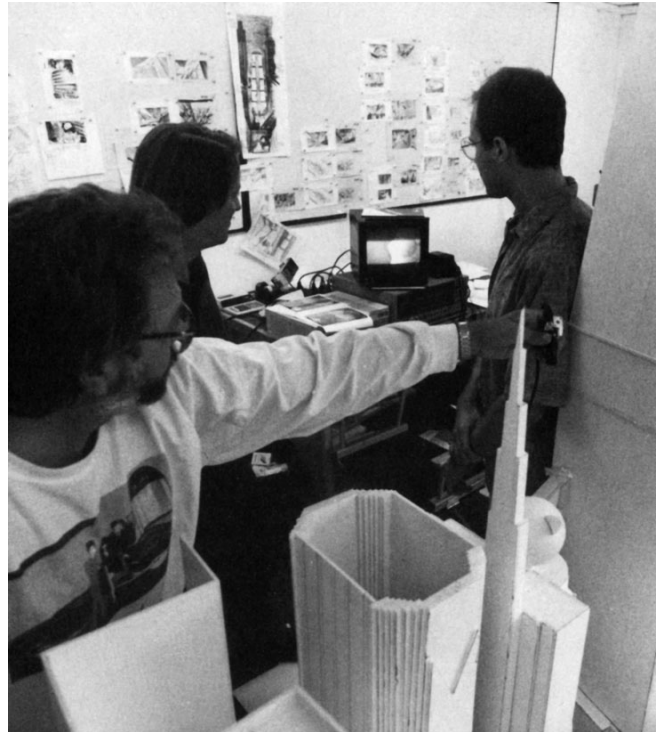
skeletal creatures, even a strange, slinky bug. The city textures included such vestiges of a lost Golden Age as surface tunnels, trolley tracks, brick roads, old buildings held up by metal supports, and gargantuan statuary heads sinking into concrete as soft and deadly as quicksand. “The idea was that this town is so corrupt, it’s literally rotting — even sinking in places,” explained Welch. “There is a lot of decay — buildings are tipping over and being held up by thin metal struts and chains. Gotham Plaza was the first set I designed because I knew it was going to take the longest to build and be the site of a lot of action — although at the time, the script was still being worked on and we didn’t know exactly what the action would be.”

The plaza structure most integral to the story was the Shreck Building, a department store and corporate headquarters for evil businessman Max Shreck. A surreal Burton touch was the Shreck company logo — a cartoonish, maniacally grinning cat head that resembled a hybrid between Felix the Cat and the *Alice in Wonderland* Cheshire Cat illustrations of Sir John Tenniel. “We were all fascinated by the choice of logos made by American businesses to project a friendly corporate atmosphere,” Burton said. “You think of the Pillsbury Doughboy or the Planter’s Peanut — they’re cute, but there’s something evil about them.” The Shreck cat would be a recurring image throughout the film as well as an all-seeing plaza presence, from a street level rotating clock head attached to the department store to a rotating head atop the Shreck Building. “The revolving cat head symbolizes the evil corporate center which is disguised with a kind of sick smile,” Welch commented. “Max Shreck is sort of the center of this corrupt universe in Gotham and all the activity in the movie revolves around him.”

Gotham Plaza, built under the gun of the strict production timetable, required some two hundred fifty carpenters working seven days a week during a peak, two-week work period. One of the key construction requirements was providing easy stage access for the Penguin and his Red Triangle Gang who lurk in the city sewers, as well as creating a crest in a road that tunneled between the old cathedral and a corner gift shop. To achieve the effect required constructing the actual concrete street surface eight feet above the soundstage floor. “We had a scaffolding company come in, and they built a reinforced concrete road bed over decking and freeway construction scaffolding,” said Welch. “It was built to withstand the weight of cranes and equipment. We cut a lot of holes in the street for the Penguin to look out or for his gang to jump down into. The crest in the center of the road created an intermediary layer that masked the ends of the road when we were shooting into the walls. It also allowed vehicles and people to crest themselves, and created a layered, old-city feeling. If you just plunk down buildings on a flat stage and then try to build a road it looks really flat.”



Serving as both visual centerpiece and primary action site for the film was Gotham Plaza, conceived by production designer Bo Welch as a decaying slice of Americana. With only the lower stories of the plaza skyscrapers built on stage at Warner Brothers, it was up to Boss Film Studios to provide the expansive shots via miniatures. A motion control elevator rig developed by Boss was used to photograph a vertical tracking shot which began at sidewalk level on the live-action set and extended upward to the top of the miniature Shreck Building.



Video animatics were instrumental in planning the effects shots. With a miniature video camera, Boss effects supervisor John Bruno shoots a foamcore mockup of the plaza while cosupervisor Brent Boates and conceptual artist Steve Burg view the results on a monitor.

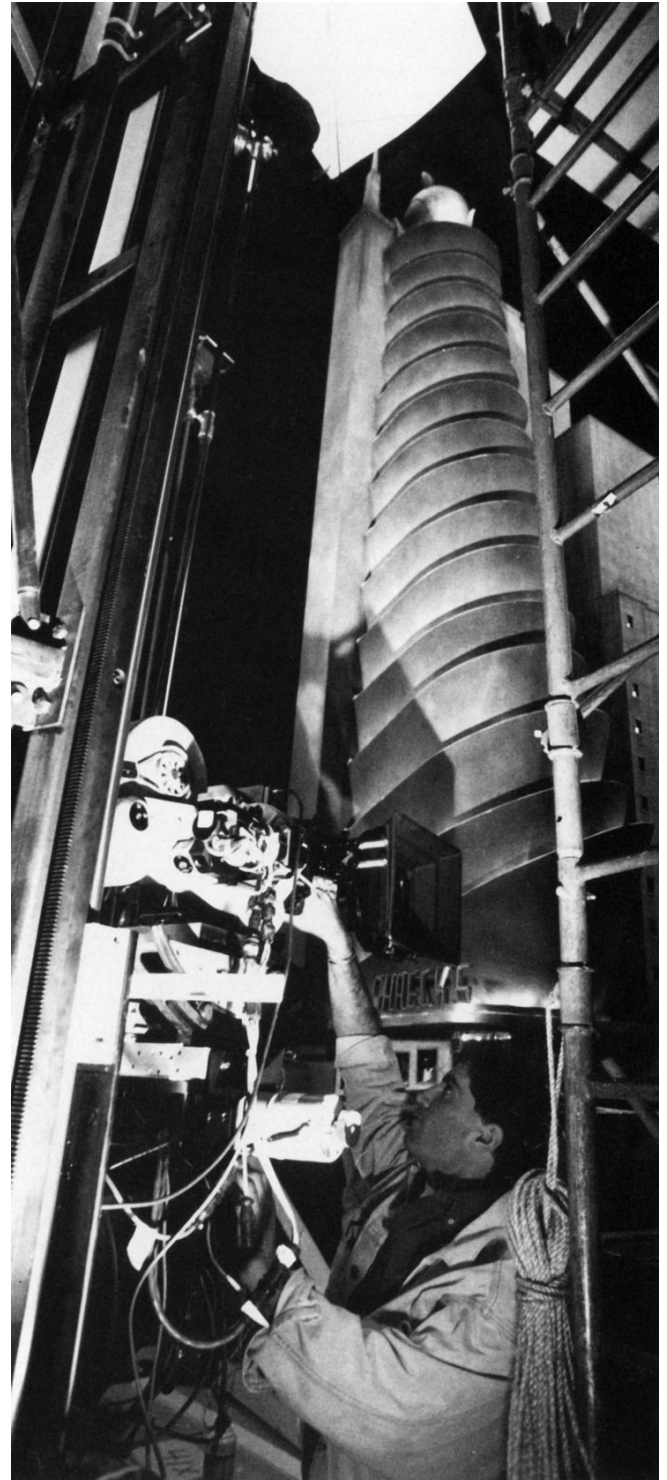


Modelmaker Scott Alexander details the ground floor of the Shreck department store.

With the story taking place during the Christmas season, the sets would be dressed out in fake snow, with computer generated snowfall added to specific shots. For another touch of authenticity — as well as the comfort of live penguins that would in part constitute the Penguin's army — refrigeration units were brought in so that the actors would exhale a realistically frosty breath. A complex process of both lowering the temperature and elevating the humidity was necessary. Chuck Gaspar brought in Aggreko, an air conditioning outfit with global contracts, to refrigerate the set. "It was a big operation," said Gaspar, a veteran of such Burton productions as *Pee-wee's Big Adventure* and *Beetlejuice*. "Refrigeration units were set outside with the condensers on stage. The system was pretty unique. Aggreko had it all on a little computer the size of a pack of cigarettes that controlled everything. The cool-down required two to three days prior to shooting. Once we got the stage down to near thirty-two degrees, we then needed to bring the humidity up to get that frosty breath look. So after taking two or three days to get the stage cold, we then had to incorporate water, or mist, into the system to get the necessary humidity. We used the Mee system — which sprays water almost like a fog — and spray guns to inject additional water."

"The air conditioners were the size of railroad cars," Bo Welch marveled. "The combination of getting things cold and then setting up a misting system to get the right combination of temperature and humidity was hard to maintain while shooting because the lights generated so much heat. It was a struggle. But what it did, besides getting the occasional breath look, was make everyone look and feel cold — because they were. It really completed the illusion of stepping into some cold, foreign environment. When you're outside in Burbank and it's eighty-five degrees, and then you step onto this darkened soundstage, your eyes adjust, you feel the cold, you see your breath, you're really transported to someplace else."

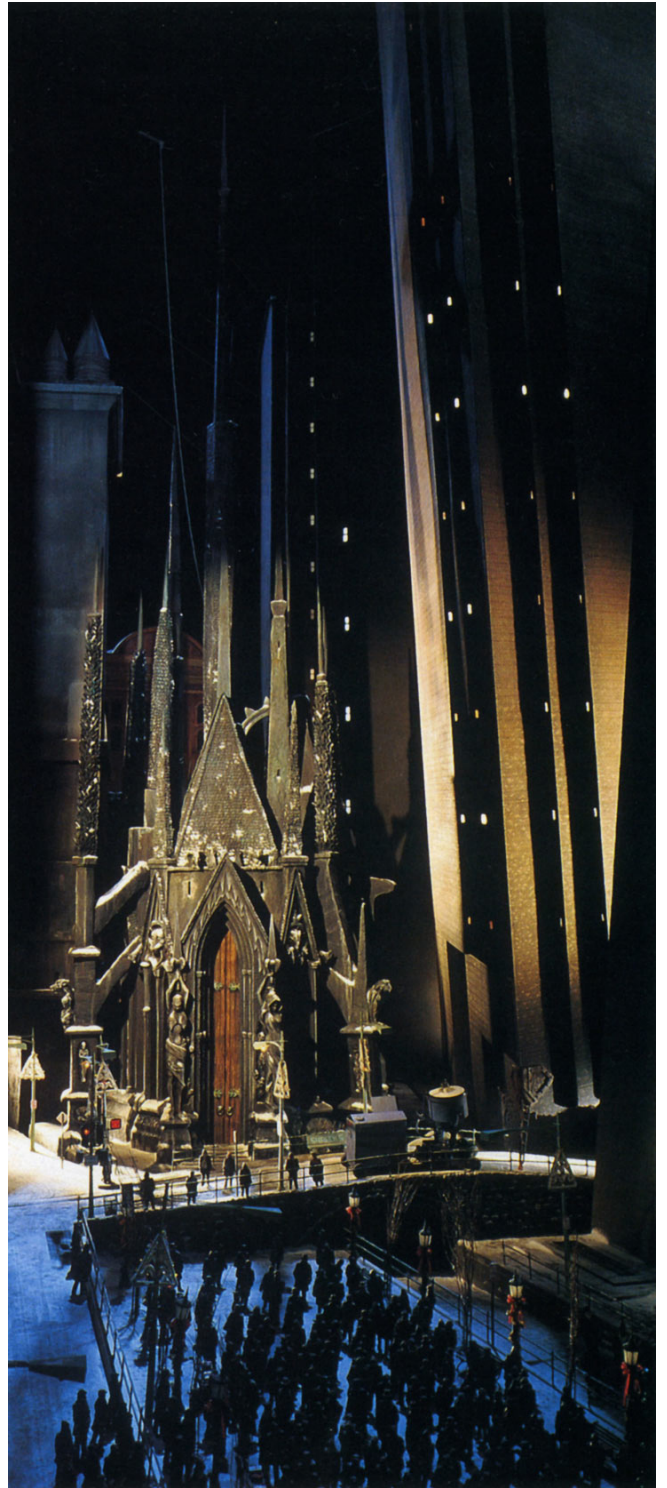
The Gotham Plaza set was part of a larger dreamscape of the moody old city itself. "I designed the city four or five blocks in every direction," Welch noted. "The concept of Gotham City is that it is



Preparing for the miniature portion of the vertical tracking shot assistant cameraman Bret Harding mounts a camera onto the elevator rig.

huge in scale, and even if you just see a footing of it there's an implied weight and scope. The plaza on the stage represents the first sixty-five feet of something that supposedly continues up for a hundred stories; so it's very vertical and very dark. Even in the middle of the day just a crack of light might get down in there. When it's extended in miniature you understand the whole picture."

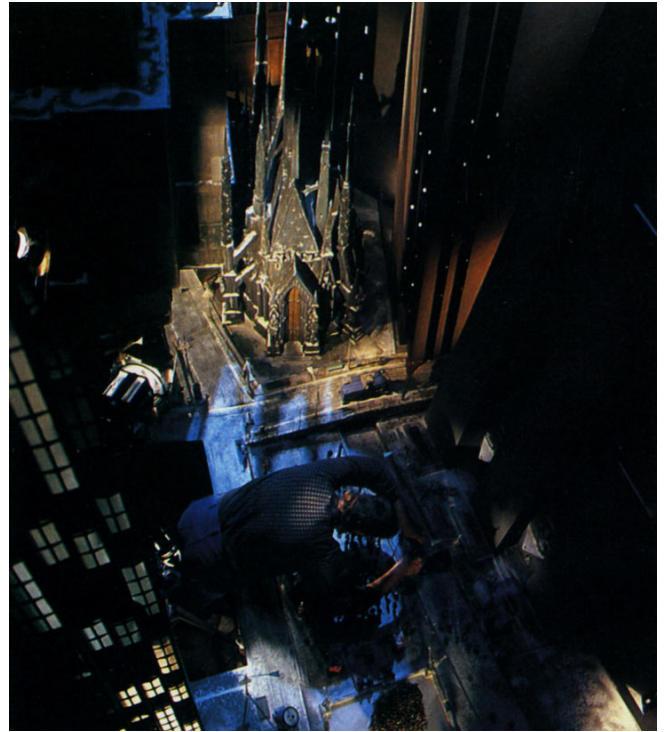
Boss Film Studios — a major effects contributor — was assigned the job of extending the city skyward in miniature, an aspect of Gotham barely explored in the first film. "They didn't, in my memory, stress the skyscrapers in miniature in the first film," model shop supervisor David Jones noted. "There were some matte paintings that suggested this in the distance and a sequence where the batwing is flying above the buildings, but more of this movie takes place up in that high skyline."



A full Gotham Plaza miniature — with buildings up to sixteen feet tall — was erected on stage at Boss.

The Boss miniatures of Gotham Plaza had to match the look and scale of the Stage 16 set — a significant challenge given that the Warner's set had integrated various perspective tricks and cheats to contain all the buildings the script demanded. "The set at Stage 16 was a forced perspective set," revealed Boss effects supervisor John Bruno. "If you were twenty feet up in the air, you would see a set that was 'squeezed' down to about two-thirds the size it would normally be, with streets going off in a sort of triangular perspective. For our miniature shoots, we had to straighten and stretch it back out. Brent Boates, Steve Burg and Tom Valentine spent two weeks building and modifying a forty-eighth-scale foamcore mockup of Gotham Plaza that would be duplicated exactly as an eighteen-foot-tall miniature set at Boss."

"In effect, we had to expand the live-action set by thirty percent in every direction so it looked right from all perspectives," Jones elaborated. "Dictel had done some hypothetical elevations of the Gotham Plaza buildings and what they would look like in the real world; but by the time everything got squeezed into their sets, they had had to make some compromises. We couldn't get away with the same cheats they had, because our buildings wouldn't look right. For instance, they only had room for about half the width of the Krystler Building to really be on the set. If you just projected that up, you wouldn't have the building that Bo Welch wanted to see in the wide shots. The Shreck Building, where a lot of action takes place, also had to be foreshortened to a smaller scale but perched into a set so you could see the building from any angle without giving the foreshortened look away." In addition to stretching the foreshortened set, the Boss model team had to match the design features of the Stage 16 structures. "In some films, the miniatures of a live-action piece might be separated by a half hour or more so you can take some liberties. In this case we would be intercutting back and forth with live-action, so we had to be very



One of the challenges faced by the modelmakers was matching their work to the stage set which had been built in forced perspective. Because similar perspective cheats would have been evident in the wider scope of the model shots, the miniature set had to be 'stretched' back out to look correct from all angles. A member of the modelmaking team attends to last-minute detailing of the plaza miniature.



careful and get everything as close as possible, which was a challenge.”

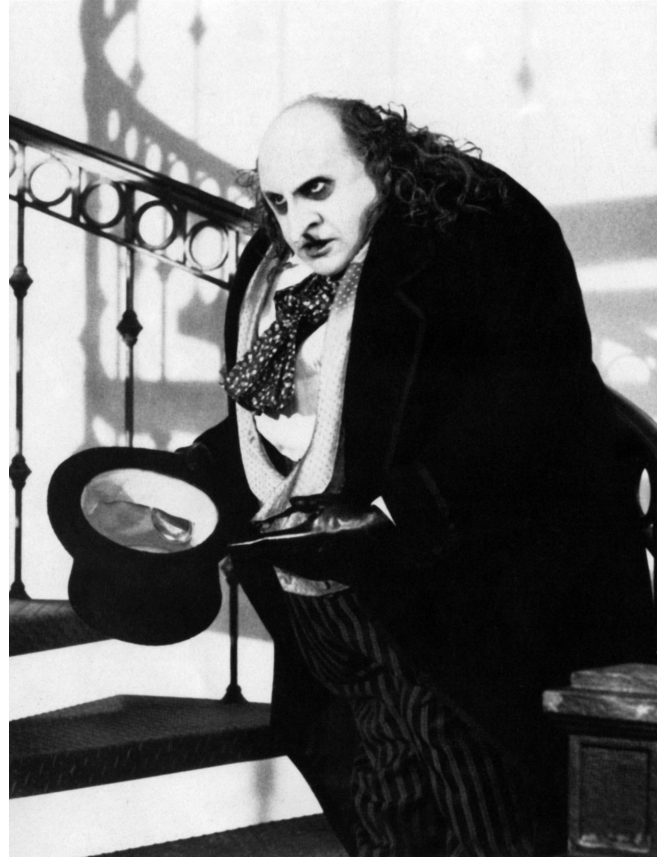
And by tradition of his own, Boss sketched such Burton-esque gothic Gotham buildings for a photo of the Black Plaza, designed to reflect the benevolent face belying the evil corporate world.

Jones set up an impromptu art department within the model shop that went to work with Tom

Valentine’s line drawings of the vertically extended

plaza buildings and the rest of the Gotham skyline. “We took the art department’s tight line drawings and turned them into drafts for our own use so our modelmakers knew exactly what we were going to build,” Jones explained. “But a flat, two-dimensional drawing reads differently in three dimensions, so Bo and some of his illustrators would come over here quite often to look at the progress on buildings and make suggestions on color, texture and scale. It was a very surreal look they were going after.”

The Boss Gotham skyline required twelve main Gotham Plaza area structures, eight background buildings and more than a dozen floater structures — nondescript buildings designed to extend the city past the main, identifiable plaza buildings. In some instances these floater buildings were used to fill in the strange Gotham skyline. “During the initial tests on mockups, we could see that there’d be quite a bit of space on either side of the government building because it got smaller as it went up,” Jones said. “So two nondescript buildings were designed by Tom Valentine to fill those gaps. Looking back in the other direction, past the church and what was called the F-15 building — because it looked like an F-15 aircraft when turned on its side — was a whole area of town that had to be extended out for a shot where Catwoman is being piloted away by the umbrella and she gets dropped. We built a dozen or more buildings that were labeled A through G to extend that part of the town. Originally we wanted to do everything in twelfth scale; but bids, budgets and time being what they were, we ended up doing it in twenty-fourth scale.”



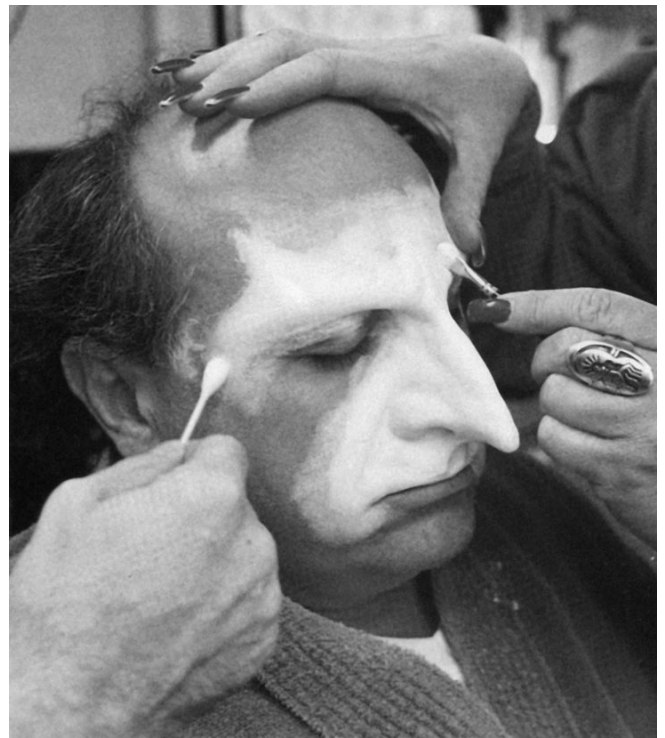
Danny DeVito as the sewer-dwelling, disenfranchised Penguin. Unimpressed by the waddling, tuxedo-clad dandy of the DC comics, Tim Burton encouraged the artists at Stan Winston Studio to create a makeup that would clearly reflect the character's twisted persona. The Winston team prepared a series of drawings and tests, ultimately producing a makeup that included a prosthetic nose, brow and upper lip, as well as black, decaying teeth.

Since the stages at Boss Film were still in production on *Alien 3*, the *Batman Returns* team used a nearby warehouse as a second stage for construction and filming of the miniatures. Jones brought in Mike Joyce to lead the team of modelmakers at the Boss warehouse annex, where the size of the buildings required that each structure be assembled in two or three sections. “It was more practical to assemble on stage in sections,” Jones explained. “We could move the things around and get them up on the set. We’d match the different edges and go back in and do some extra stuccoing, plastering or detailing at those places where they joined. We had plates built into each section that helped us line them up when we stacked them together. Most of the buildings were constructed from one-by-threes and door-skins, which is like a plywood. Then, once the main shape was there, certain details were done either in pine or gelutong, a very fine, even-grained pattern-maker’s wood. We’d carve a detailed section, then we’d pull an RTV mold and do a urethane casting so that we could make as many as we needed. Before we painted it, we would seal the wood surfaces and then cover them with a lightweight stucco material which dries very fast. The lightweight nature of it helped — some of the buildings were five feet across and sixteen feet tall and needed a lot of surface area covered on them. We built almost all the buildings on three sides, but a couple of them we had to build four sides because we’d have to shoot from the back and front.”

With the miniature construction completed, it was then up to Boss director of photography Garry Waller to bring the ‘city’ to life. The art direction dictated that the models be lit from below, with darker, moonlit contrasts as the camera scaled to the top of the skyline. “The miniature was the star for us,” said Waller. “Since most of the buildings were close to twenty feet tall and filled a twenty-by-thirty-foot-square area, it was basically like lighting tall objects within a box. It was very creative for us. The lighting,



In the early testing phase, a variety of appliance pieces were sculpted onto plastic shell likenesses of DeVito and then presented to Burton for his input and approval. Art department coordinator Shane Mahan sculpts a near-final version of the Penguin makeup.



During production, Ve Neill — who was responsible for the daily application of the makeup — blends the edges of the appliance onto DeVito’s face.

with cracker smoke added to blend everything, created the moody atmosphere.”

A counterpoint to the rarefied heights of Gotham was the Penguin’s underworld kingdom in the abandoned Arctic World pavilion beneath the zoo. Traveling the subterranean network of the Gotham sewer system, the Penguin could wage a campaign of fear and destruction on the city above, aided by his army of penguins and the Red Triangle Gang, a freaky bunch of outcasts from a long-since-folded traveling circus. With his hunchbacked body, webbed hands and birdlike face, the Penguin was the perfect followup to the toxic-scarred Joker of the first film — and an example of the new spin the production would give to aspects of the *Batman* legend. Burton’s horrific interpretation of both the Penguin’s appearance and origin would be drastically different from the character’s comic book roots. As was the practice in most early crimebuster comics, many a gruesome villain with mayhem in mind would be introduced with nary a wink at the physical and psychological turmoil that might have shaped his character. (Even the Joker appeared in 1940 as a full-blown freak, his chalk white face and green hair unexplained in the comics until 1951.)

Cartoonist Bob Kane introduced the Penguin in 1941 as a tuxedo-clad, waddling dandy outfitted with monocle — a lover of Shakespeare, trick gadget umbrellas and bird-themed crimes. Kane’s inspiration was not based on any exploration of criminal psychology, but in the visual flash of a cartoon penguin logo once used to hawk Kool cigarettes.

For Tim Burton, the Penguin had to be fleshed out into something more than a visual sight gag if the character was going to impact on movie audiences. “I never liked the Penguin,” Burton commented, “he never made sense to me. I’ve always thought that characters like the Joker or the *Catwoman* were much easier because they’re clearer. But the Penguin was this fat guy in a tuxedo; and you never quite understood what the character was. I think it’s important that you find some psychological foundation for these characters, no matter how absurd it is.”

Burton engaged Stan Winston Studio to help create a totally fleshed-out character. Winston — who had worked with the director on *Edward Scissorhands* — was determined to realize a makeup that would capture the Penguin’s potentially twisted sensibilities. “For me,” noted Winston, “the Penguin was something that had to work for Danny DeVito and ultimately work for Tim Burton and his vision of the character. Tim Burton has a very specific look, a very cartoony, over-the-edge feeling. On the first makeup test at our studio, we went over the top, with Tim Burton-esque dark eyes and white skin. For the second test, our makeup artist, Ve Neill, did a beautiful job that looked extremely real. The problem was that it was so real, it was no longer Tim Burton-esque. I told Ve to go back to the more extreme look. It was good that as a makeup artist she had initially put that element of reality to it; but we had to fit into the color, texture and feeling of a Tim Burton movie.”

Makeup artists Shane Mahan and John Rosengrant were specifically assigned to the task of creating a face that would not only be a bizarre take on the traditional Penguin look, but would also match the grotesque Penguin body design. Winston illustrator Mark ‘Crash’ McCreery, starting from Burton’s sketches of the character, rendered a series of drawings of a jowly, top-hatted villain with monocle and beakish nose. Portrait-quality sketches of Danny DeVito were also rendered from different angles, over which the Penguin features were drawn to match the actor’s face. The philosophy behind the makeup was that the final look not obliterate the actor. “After the illustration phase, we made some plastic shells of DeVito’s face from a lifecast,” Mahan explained. “Then with John, myself, and Stan helping out, we blocked out five or six different nose shapes, little plastic

plant-on appliances. We'd take the plastic shell heads over to the Warner's costume shop where they were constructing the Penguin body, and we'd put the heads up and Tim could make adjustments from there."

"The initial concept was a pointy nose," Winston noted, "but I wasn't really happy with that. The pointy nose just reminded me of a witch. So I got my hands back in the clay, which I love, and started playing with one myself. I felt the nose should have a beaklike quality. Years ago, for the Michael Jackson film *The Wiz*, I did some makeup for these crow characters that had enormous beak faces. I just loved that design, which involved the whole forehead and brow that went into this beak. Of course, that had nothing to do with penguins; but I felt I could use that concept with Danny and that turned out to be the look that was ultimately selected."

Even the teeth were a key element of the overall makeup design. "Tim Burton and Danny DeVito wanted the teeth to look sharp and menacing," John Rosengrant stated, "yet rotten and neglected looking, since the character was pretty much living underground where there was no dental program. There were several sets of teeth for DeVito to try on, each with a little different look." Eventually, the teeth included both a full frontal piece and a lower set of teeth that were very long and uneven. "The rest of his teeth were colored with traditional tooth enamel colors to help blend the pieces," said Mahan. "The teeth really completed the makeup. Normal teeth would have lessened the impact of that stark, gruesome makeup."

The Winston crew noted that the final look of the character, with his ghostly pallor and dark circles under the eyes, was very much in keeping with all the other weird characters inhabiting the Burton pantheon. "That look seems to be a theme running through all of his films, like *Beetlejuice* and *Edward Scissorhands*," Rosengrant noted. "Tim Burton likes German Expressionism, which has that kind of look, with the white face and black lips. But it works. It's his vision."

Supporting the expressionistic makeup was the Penguin costume, designed — along with the new batsuit and *Catwoman*'s catsuit — by Bob Ringwood and Mary Vogt and executed by costume effects



While the Arctic World lair of the Penguin was constructed as a full-size set on a Universal Studios soundstage, the old Gotham Zoo in which it was situated was built in miniature by Stetson Visual Services and photographed at The Chandler Group. The sprawling model consisted of a main tabletop setting augmented by 'floaters' set pieces that could be positioned around the perimeter in response to specific camera angle requirements. Crew members ready the model for an expansive shot



For a flyover revealing the abandoned zoo grounds and its ghostly pavilions, Chandler developed a special motion control crane to skim the surface of the model in a carefully choreographed flight path.

supervisor Vin Burnham. With the makeup and costume completed, it was up to DeVito to breathe life into the character. Tim Burton felt that DeVito's macabre incarnation as the birdman of the Gotham sewers rivaled Nicholson's maniacal Joker turn. "No one would talk to Danny on the set because he scared everybody," Burton laughed. "I don't know if that was his usual way of working, but there was a point where he just clicked into it and was completely this character who was totally antisocial, that had been out of the loop a little too long. Danny was one hundred percent into the transformation. With the makeup and all, it was a complete creation."

The Penguin's lair was in the grand *Batman* comic book tradition of such lonely criminal hideouts as haunted mansions, abandoned factories and redlight district flophouses. The set for the netherworld habitat required the refrigeration units used for Stage 16 both to reflect the winter time period and protect the live penguins. Because the set required the biggest possible soundstage — and since the largest stage at Warner's was already filled by Gotham Plaza — Arctic World was constructed at Universal Studios. "Arctic World combined every kind of conceivable trick and effect," Bo Welch commented. "It was floor-to-ceiling on the biggest soundstage at Universal and three-quarters of it was water. We had puppet penguins as well as two different species of live penguins, fire effects, explosions. Arctic World was designed as this old, decayed animal pavilion with bleachers and a central performance island and refreshment stand. At one time, when it was brand new, it had looked like some soft, stylized ice flow in the Arctic; but over the years, it had gotten green, rusted and rotted, and had taken on its own style of elegant decay. There's a consistency to the images Tim is drawn to in his films, in this particular case a decayed piece of Americana. The cemetery in *Beetlejuice* is like that, and the old house in *Edward Scissorhands*. They're all part of a family."

The center of the set, and the spot where the penguins were most often to congregate, was the Arctic World island, which topped off at eighteen to twenty feet at its summit. *The Island* would be populated by live penguins as well as penguin puppets executed by Stan Winston Studio. Since most of the puppet penguin shots would require that the puppeteers be positioned underneath *The Island*, a major construction concern was that *The Island* be as watertight as possible. "*The island* was constructed in a tank with a weir wall to keep the water out," Welch commented, "but the water pressure on *The Island* was amazing. The set had a concrete floor and was basically constructed out of wood frame and lathe and pool construction concrete. It was difficult to make it waterproof, even though we had bilge pumps going twenty-four hours a day. There was a little bit of leakage where the set met the floor, no matter what, so it was a spooky place to work."

Another quirky Arctic World touch — which was in the spirit of the cartoonish flourishes featured in Gotham Plaza — was an antiquated air conditioning unit, a run-down machine clinging mechanically to life with shudders and sparks. "We called this big generating unit 'The Icebox,'" said Chuck Gaspar. "We put it on truck springs to dance it around the floor; and there were sparks coming off of it which we did using a little charge, just firing off the charges from a nail board."

The ghost town grounds of the old zoo, which included both the entrance to Arctic World and a number of eccentric looking pavilions, would be duplicated in miniature by Stetson Visual Services. The miniature set would be used for an establishing flyover shot and as a bombing zone for the penultimate confrontation between *Batman* and the Penguin. Working in tandem with Stetson, The Chandler Group began preparing for the photography and pyrotechnic challenges of the sequence.

Once completed, the miniature pavilions were delivered to Chandler and incorporated into a ruined landscape tabletop miniature which Stetson Visual had constructed on Chandler's stage.

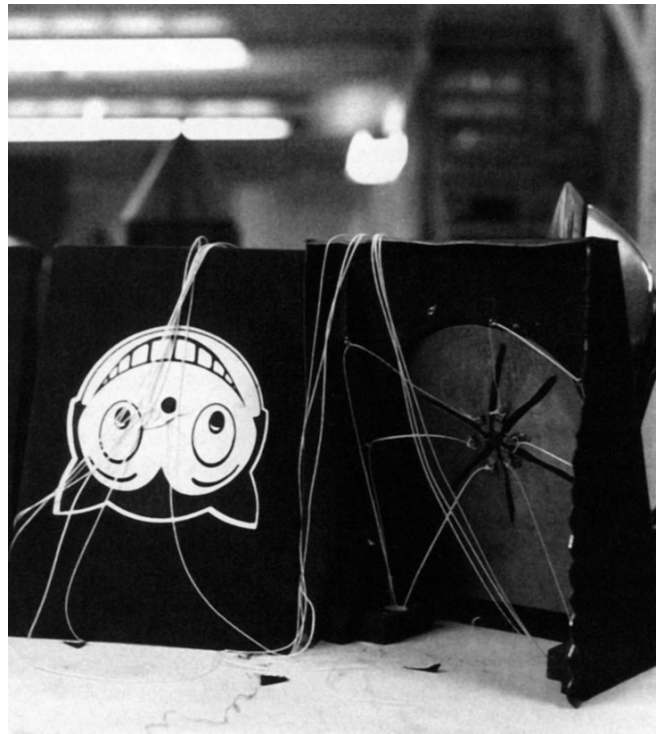
Bo Welch's art department provided Stetson with a quarter-inch-to-the-foot model to be used as a reference guide for the zoo grounds miniature. For art director Rick Heinrichs, the use of production models was a crucial element in achieving the graphic, expressionistic look favored by Burton. "We made character models of all the major sets in the picture," Heinrichs explained. "A lot of production designers and art directors are from an architectural and interior design school background. What normally happens is an illustrator or production designer will do some drawings or sketches for the director to look at and a modelmaker might turn that into a clean, white architectural model of whatever the set is. The whole process tends to drain the character and the emotional content out of the set. We go right for the character and the feeling from the beginning. By turning a model over to the companies that will build the sets, they can work out problems or reconfigure as need be. It's just an incredibly powerful tool."

"The old zoo model from the art department was this little jewel," Mark Stetson marveled. "We took it and went straight to work. Chandler acquired a very tiny video camera which Don Baker rigged to their motion control and did about twelve video passes right through the model. Based on those move tests, we determined that to get the timing of the move, we had to reconfigure the miniature and essentially compress all the exhibits a little closer together."

Another construction concern was that the finished model accommodate the eighty-by-eighty-foot Chandler stage. "We were originally hoping to do a sixth-scale model," Stetson said, "but we just couldn't fit everything on stage at that scale, so we cut it down to eighth scale. We constructed it so the main tabletop was about forty by forty feet; but by using floating tables along the perimeter, we could get the full set to about seventy feet long and fifty-five feet deep. The actual construction of the zoo took six to eight weeks." The dual elements of the construction included the central tabletop section, which comprised some eighty percent of the terrain, and the wild tabletop pieces that could be repositioned as need be and foamed in to match the ridged contours of the main section. Additional wild elements, which could be placed as needed in openings in the main part of the set grounds, included such pavilions and park structures as the Arachnosphere and crab pavilion, the old zoo gate and the bridge from which baby Cobblepot was tossed that fateful winter night. "For the pavilions we used mostly aluminum wire and plaster and screen. Since the pavilions were supposed to represent temporary structures from an old world's fair or expo, we ended up using Rose Parade float construction technology for a lot of it — bent wire and screen covered with thin coats of plaster that were very easy to degrade and break down. Len Ricci and Dana Yuricich did most of the wire sculpture. We actually burned and broke through some of the structures and applied additional layers of screens and mesh to give it an old decayed look. The main tabletop was built in place by construction coordinator Dickie Welch and crew, and foamed in to create the contours of the park which included all the pavilions, fencing, seven hundred miniature trees, park benches and a bridge. All those details that could be lifted off and removed from the table we built in advance in our shop, stored and then brought to Chandler when we had finished the tabletop."



Bo Welch and Brent Boates examine a pair of Shreck company cats — prominent features on both the soundstage and miniature sets. The production designer's influence extended well beyond the full-size sets to include virtually every visual aspect of the film.



When the scheming Max Shreck discovers his mousy assistant Selina Kyle, snooping in the files of his penthouse office, the mogul promptly pushes her out the window. Selina's fall was story boarded to follow Michelle Pfeiffer as she drops through a series of awnings to the alley below.

It was up to The Chandler Group to solve the visual effects and lighting problems for the old zoo sequence, including the swooping midnight flyover establishing the deserted grounds hiding the Penguin's lair. In theory, the lighting was to be a simple moonlit source that matched the look of the first unit photography. Chandler director of photography Tim Angulo found, however, that duplicating the live-action look in miniature was problematic. "There was an over-saturated blue overall and almost no fill light in the live-action," recalled supervisor John Scheele. "With Tim Burton's blessing, we began to take some liberties and work back in other light sources and colors. Mike Fink found a clip from the live-action that justified a totally illogical God light to illuminate the polar bear statue featured on top of Arctic World. Tim Angulo cheated the single moonlight source by employing a number of instruments to cast shadows through the trees. And he used warmer source lights on the rubber duckies suspended above the zoo, the crab and the aviary so that their original colors would stand out."

The pyrotechnics featured in the climactic sequence at the zoo grounds would require blasting the set with 18K HMIs to hold depth of field at a one-hundred-twenty-frames-per-second film rate. In shooting the flyover, however, Angulo could use a more varied approach. Shooting with a wide 18mm lens, and stopping down to f/16 at six-second exposures, he was able to achieve a magical, floating feel. "In the flyover," Scheele commented, "we crossed over a great deal more terrain and had to light the entire set at once. We also had the opportunity to employ more subtlety, as in the area around the zoo sign. Tim Angulo came up with an idea everybody liked, of spilling pools of warmer light from the street lights near the entrance. This reinforced the sense of a border leading into a separate and colder terrain. Stetson's team also layered in a lot of small flourishes, like holes in the perimeter fence where animals might have burst out and fled the zoo."

Having fallen in love with the miniature landscape, the camera crew wanted to program a move that would take in all the decayed wonders of the old park in the establishing flyover shot. However, Tim Burton wanted to follow a relatively direct path through the zoo gate and over the bridge, crossing through the giant crab's claw and on to the mysterious light flickering in the windows of Arctic World. Mike Fink, Don Baker and John Scheele conducted move tests which enabled them to carefully plan the flight path. "Most of the extreme move ideas were worked out in the animatic process," Scheele noted. "Even later there were some refinements — especially as to timing. Tim was always very specific about what he wanted, instructing us via Mike Fink to 'add a little roll' as we passed through the claw or 'don't bother diving down into the riverbed' — those kinds of adjustments. Since the pavilions were constructed separately from the set, they could be repositioned to make the shot work. We ended up shifting the bridge around at the very last moment so it would play better to camera."



To impart the impression of the camera moving down the building and through the awnings, a twelfth-scale model of the Shreck Building was placed on its side and filmed via motion control with a snorkel lens. As the camera advanced, prescored miniature awnings were ripped open in sequence by invisible wires. Garry Waller studies the setup just prior to beginning the shot

Because the flyover required the camera to be extended out twenty to thirty feet, with close clearance over the landscape surface, Chandler had to design a special motion control camera system to accomplish the shot. “We had to fabricate an entirely new boom arm in a big rush,” recalled Scheele. “Three machine shops were working overtime to get on-line by the deadline, adding extensions to our Tiny Tim camera system tower. In the end, we had a twenty-foot vertical reach, with a twenty-two-foot reach out over the set. In addition, another ten-foot arm extension was standing by in case the move expanded. It was built like a construction crane, and this allowed us to reach out and over the various tall structures in the model without crashing into them. The linear movement of the axes also made programming more straightforward compared to the arcing path of a conventional boom.”

A pitching snorkel lens complemented the camera rig and provided the maneuverability required for the shot. “It was a fully stepper-driven system that we’d been using for a number of years,” Scheele described. “It allowed for full pan, tilt and roll of the lens elements, and gave that free floating point of view to the shot. The package was small enough that we could sail through tight openings in the miniature. And since the camera was moving at a slow film rate, the camera assistant could reach into the set and pluck out the top of the zoo sign — the only structure that actually blocked the passage of the lens — as the camera passed through.”

The use of miniatures would be a significant aspect of the entire production, particularly for making the transitions from Gotham’s streets to the penthouse offices and rooftops where many key scenes would unfold — including a scene in which Max Shreck plots his corporate takeover of Gotham in his penthouse suite. The scene featured an important crane-up shot of the Shreck Building, from street level to the giant, rotating cat’s head above. Boss Film was tasked with completing the shot. “We were asked to devise a way to crane up off of the Shreck set at Stage 16,” John Bruno explained, “accelerate to a blur and end up on the giant rotating cat head that sat above Shreck Tower, which was a twenty-fourth-scale model. Using a forty-eighth-scale mockup of the Stage 16 set, supplied to us by the production, Neil Krepela and I calculated that the vertical move necessary to achieve the shot would be close to forty feet and would have to be repeatable to at least one-thousandth-of-an-inch.” Mark West designed what Boss Film would dub the ‘elevator rig’ which could carry a 65mm camera package, remote head and all, vertically at speeds upwards of thirty-two miles per hour and repeat the move to within five-thousandths-of-an-inch. Garry Waller supervised the complex vertical shot on Stage 16. Then, back at Boss, he took the motion control data from the live-action shoot and recalculated it for the miniature camera move. “The live-action move was actually slower than we thought,” Waller noted, “so when we came back to shoot the miniature we had to speed up the move to give it more scale. We transitioned the vertical pan by using a beam to blend the higher speed, and continued all the way up to the Shreck cat head.”

The penthouse office of Max Shreck would be the setting for the pivotal sequence in which Selina Kyle, a cute, but mousy aide to the Gotham mogul, undergoes the transformative experience that makes her into the leather-clad, whip-cracking Catwoman. Suspecting that Selina has discovered his takeover plot, Shreck pushes her out the penthouse window. Selina crashes through successive levels of awnings — embossed with the grinning company cat — and lands in the snowy alley below. For a time she is still, her eyes closed in death's cold repose. Then cats come out of the shadows to awaken her.

The sequence began with a locked-off shot of a stuntwoman crashing out of an office window. With subsequent live-action stunt footage establishing the long shots, it was up to Boss to create a down-angle move that would follow Michelle Pfeiffer as she fell through each awning. A motion control camera would punch through a miniature awning set and be composited with a bluescreen down-angle head-and-shoulders shot of the actress. "The model of the Shreck Building for Selina's fall was twelfth-scale," said Dave Jones, "which was large enough to accommodate the camera lens as it passed through the individual awnings. Since that model was almost twenty-five feet tall at scale, we elected to turn the whole thing on its side. That not only facilitated shooting on our stages, it also meant we didn't have to use a long boom arm, which would have tended to swing in an arc rather than creating a straight fall. We could do a simpler move through the awnings using our motion control camera track, with the camera going parallel to the floor for most of the move. Garry Waller, using a motion control camera fitted with a snorkel lens, programmed the simulated fall through the miniature awnings as they were pulled apart by hidden wires."

Looking for an extra element that would add life to the shot, Bruno noticed a miniature van in the Boss model shop that had been created for a series of DHL commercials. Bruno proposed shooting the miniature turning the corner of the Shreck building below to provide a little bit of background action. "We attached the van to a simple swing-arm mechanism that would move perpendicular to the floor of the stage at the base of the Shreck Building," Jones explained.



A bluescreen element of Michelle Pfeiffer was later composited into the background model plate. The actress was positioned on a stool in front of a bluescreen and photographed performing her actions in slow motion to synchronize with the miniature plate photography. Miraculously surviving the fall, timid Selina is transformed into the predatory Catwoman.



With not only the Penguin, but now the Catwoman on the loose, the Gotham police summon Batman by way of the traditional batsignal in the sky. Matte World realized the establishing shot of Wayne Manor and the batsignal beyond as a multilayered in-camera effect combining a miniature mansion with a painted background and batsignal artwork projected onto fiberfill clouds.

Once the background was approved by Tim Burton, the all-important bluescreen shot of Michelle Pfeiffer could be completed. The actress, sitting on a stool with air blowing her hair to simulate the freefall, had to act out the scene in slow motion to sync with the required motion control camerawork. “What Tim was trying to do was to show that during this fall Selina becomes the *Catwoman*,” Bruno stated. “The camera had to be on her face so you could actually see the terror in her eyes as she was falling, hitting and ripping through the awnings. Neil Krepela shot Michelle Pfeiffer against a bluescreen as she sat in front of a motion control dolly which repeated the move. Because the move was preprogrammed, Michelle and Tim were left free to concentrate on performance.”

Taking on the persona of a cat, the new, slinky Selina plots her vengeance against Shreck, becoming yet another underworld character causing trouble for *Batman*. With the *Catwoman* prowling Gotham’s rooftops, the Penguin making a surprise run for mayor, and the Red Triangle Gang still on the loose, the beleaguered Gotham police department has no choice but to fire up the batsignal to summon their *Dark Knight* to join the fray. The establishing shot of Wayne Manor, with the batsignal striking the clouds above, would mark another creative departure from the 1989 film. Wayne Manor had been the only location shoot of the first film, with the historic Knebworth House outside London conveying the comforts of Old World wealth. In *Batman Returns*, however, the new manor would look more like a haunted house.

Originally, Matte World had been commissioned to render a painting for the establishing shot of Wayne Manor and the batsignal. However, when it was decided that an additional shot of Wayne Manor, from a slightly different perspective, would be needed for a later sequence in the film, Matte World opted to create the establishing shot as a multilayered in-camera effect combining a four-by-four-foot mansion miniature — built by Renegade Effects — with a painted background. Creating the iconic batsignal shots themselves, which were in Matte World’s charge throughout the film, was a simple process. “We just stuck a slide of the batsignal — which had been shot from artwork — into a slide projector,” recalled Matte World effects cosupervisor Michael Pangrazio, “and projected it onto a fiberfill cloud material that was adhered to a lexan sheet. We exposed it for three to four frames per second because it wasn’t that bright and required a long exposure time.”

There were, however, a few major technical problems to overcome before the batsignal could call *Batman* to action. Matte World discovered that while it was easy to project and film the batsignal as two separate elements — the projected beam and the bat symbol itself— it was a challenge to combine the two on the same piece of film. “To get an exposure on the symbol,” said Pangrazio, “we just put the slide in the projector, filled the room with smoke, and shot it. But when we rewound and tried to put the beam in, the symbol itself was always much brighter than the beam. If we shot the beam at its ideal exposure, then the symbol would be totally overexposed. It had to do with the differences between the light hitting a solid surface — in this case the fiberfill clouds — and the light going through the particles of smoke that were illuminating the beam itself. There was too great an exposure gap there. We ended up first exposing the symbol on the sky. Then we just rewound that unprocessed film, brought it to a new camera and rotoscoped out the projected symbol, making sure that it was in the proper place on the new surface. Next we painted in the beam by hand and re-exposed that painted beam onto the original negative — just burning it in,

exposing it to the degree that looked right. Whenever you can isolate things on film and work with separate elements, you can control their exposure and their relationships much better.”

An added visual wrinkle was playing the beacon against a moving cloud surface — a dynamic enhancement of the batsignal effect recommended by Mike Fink. “One of the things we wanted to bring to the film that the original didn’t was to have the symbol projected against moving clouds so that its shape would change subtly,” Craig Barron explained. “The crew adhered fiberfill clouds to twenty-foot-long, ten-foot-high scrims set on motion control tracks. With three different layers of scrims, and backlighting on the fine material, the result was a big diorama that existed in the eye of the camera. You can make dark clouds look good by just sculpting the fiberfill — taking an edge off here, making it a little thicker there — basically art directing the sky to make it look realistic, and then moving it on motion control tracks.”

“It’s very subtle,” Pangrazio added, “but there’s a life to the shot that wouldn’t be there if the clouds weren’t moving. Our three layers of cloud movement consisted of a static layer, a cloud section moving slowly one-third of the way up, and then the top part moving faster in relation, which provided overall dimension and perspective. We also adhered some clouds onto bridal tulle, a translucent material that works like an artificial smoke to help provide atmosphere and depth. So basically we created an artificial world with materials you can get at the fabric or department store.”

The grounds of Wayne Manor were similarly fashioned from everyday materials. “The whole hillside was just a base upon which to put the mansion model,” Pangrazio said. “We used cardboard boxes with king-size bedsheets thrown over them and stapled down to create a broad twenty-by-twenty-foot area with a soft, rolling hill effect. We covered it with baking soda and went around the neighborhood making a raid for twigs that would serve as miniature trees. To get the scale just right, we wrapped the twigs with different gauge wires to continue the branches up to a fine taper.”

In an almost Victorian-era touch, Wayne is alerted to the batsignal’s call by way of a mirrored rooftop reflector which would collect the sky light, swivel and redirect the beacon to a garden reflector which, in turn, would shine the signal light into the darkened library where Bruce Wayne awaits the call. The reflectors not only recalled the exotically designed mechanical contraptions of classic H.G. Wells and Jules Verne science fiction tales, but were also required to function. “The drawings by Marty Kline from the production had the look of an old-fashioned dental tool or a Jules Verne-era type contraption using belts and gears and all kinds of crazy contrivances to make it move,” recalled Howie Weed. “As I understand it, the production artist who drew it just came up with the idea in his head. We had to decide whether we could make it move as it had been drawn, or do some kind of cheat using monofilament lines. We finally decided to try to fabricate it the way it was drawn. We brought in a machinist named Bryan Dewe to work on the mirror. We left this drawing in his hands to interpret and make it work in a mechanical way. Bryan did some drawings and actually machined the whole thing out of solid aluminum. It was so impressive we didn’t want to paint it. The final mirror was controlled by two little rods that ran down the backside to stepper motors with two tiny worm gears at the top. As it rotated, a big cog on its side turned, making it appear as though it was turning the whole thing. The mirror could also tilt up and down and pan left and right. It was amazing that a production artist drew this thing out, not knowing whether it would work, and Bryan was able to interpret that and actually make it function.”

The shot of the reflected signal light streaming through the library window and hitting the back wall was shot live-action with a bat image projected on set with actor Michael Keaton. However, the first unit faced the same problem of exposing both symbol and beam together that Matte World faced in its miniature work. To solve the problem, Matte World would not only add the beam to the shot, but do some repair work on the projected bat symbol. “The bat symbol was projected onto the wall so that Michael Keaton could react to it,” said Barron. “When the signal came on, Michael could stand up into the beam. Unfortunately, the heat from the projector caused one of the batsignal’s wings to crack during the shot. We traced out where the wing should have been and then Brian Flora made a matte to repair that area. For the beam itself, he made a separate painting that was double-exposed to come in through the aperture of the window and line up with the bat shape projected on the wall. The beam light was a plus exposure, a burn-in that added exposure to the shards of existing light. Michael Keaton’s face was being lit up by the existing projection of the symbol on the far wall, and our matte painting was just adding more exposure because the beam from the projected symbol wasn’t bright enough to expose on the set. Of course, the symbol and shard had to switch on together; so we composited the elements optically, which was more straightforward than trying to work out the timing cues for each take as a latent image composite.”

One of the classic attributes of the batsignal from the comics was its eerie omnipresence. Good citizens of Gotham gazing out their windows at the night sky could take solace knowing their *Dark Knight* was being called to action. But for the denizens of the underworld, a batsignal sighting was tantamount to thrusting a crucifix in the face of *Dracula*. *Batman Returns* featured a Penguin POV of the batsignal shining in the night sky beyond the sewer bars gilding his subterranean home. The shot, another multilayered Matte World effect, was assigned to Brian Flora and required a painting of some buildings, the sky beyond created with sculpted dacron clouds on glass fitted to a motion control mover, and the addition of the batsignal symbol and beam. “It was an interesting shot to work on,” Flora commented. “It gave me a chance to work in a three-dimensional domain. I painted the buildings, created the clouds, and — working



The Wayne Manor setting was a forced perspective miniature dressed with baking soda snow and ordinary twigs finished with tapering wire to simulate dormant trees. Matte World effects supervisor Michael Pangrazio and grip Todd Smith add last-minute touches to the set



In the manor garden is a mirror relay programmed to capture the batsignal beam and redirect it into the library where Bruce Wayne awaits the call for help. Originally slated to be done as a matte painting, the bat reflector was ultimately constructed as a functional model to provide panning and tilting movements. Camera assistant Drummond Stone and motion control cameraman Joel Hladecek position the reflector on the forced perspective set.

with effects cameraman Wade Childress — supervised the lighting. On the painting itself, there are spotlights that light up the buildings. We took inkies and focused them on little areas of the painting to make them brighter, punch them up a little bit. Then there was lighting on the clouds, which were difficult to light because there had to be a very subtle increment of haze to make them look real. The clouds had to be a little brighter than the buildings, because if the sky tone was too close to the tones of the buildings you wouldn't be able to resolve the edges of the buildings. The sky was backlit to simulate moonlight; the clouds in front of the sky were darker, and it all had to be flashed. We had scrims between the glass painting and the clouds, as well as a scrim in front of the entire scene, so we could flash them all independently. It was subtle, but in dailies we could see differences down to even a tenth of a stop."

Called to action, Bruce Wayne descends into the batcave, where he will undergo the transformation into his alter ego — *Batman*. As a surreal touch to Wayne's descent, Tim Burton asked Chuck Gaspar to rig up an iron maiden torture device to serve as a passageway to the batcave inner sanctum. In the shot, *Batman* closes the entrance; and as his back is to camera, spikes shoot out and retract around him. "The spikes all had to be done pneumatically," Gaspar said. "Each spike had its own little cylinder. There were something like five to seven thousand dollars just in pneumatic cylinders. One switch controlled everything, so the spikes would zip out and contract individually."

The batcave, *Batman*'s high-tech crime fighting nerve center, would be another redesign effort. The 1989 batcave was styled by Anton Furst in a *Phantom of the Opera* style, with skyscraper foundations protruding through the cave walls — a slightly baffling take given that the cave was located miles outside town, deep below the wooded countryside. The new batcave would feature sheer shale walls and precipices overhanging bottomless drops. The Batcave work areas would be realized as set pieces on a Warner Brothers soundstage, with Matte World artist Bill Mather extending the cave to its full dimensions.

To begin work on the painting, Matte World journeyed to the Warner Brothers batcave set and shot latent image Vistavision camera angles approved by Burton. The final batcave painting would be exposed onto the original negative of the live-action plate, and the precomp would then be sent to Video Image for scanning and the addition of computer generated bats. Because Burton intended to rely heavily on matte paintings to create the scope of the batcave, the live-action set was unassuming. "The set was a small area maybe eight feet off the ground," Mather noted. "There wasn't a cavernous sense of depth. The biggest set in the world couldn't provide what the matte shot ultimately would, which was this huge cavern with stalactites and stalagmites going back in perspective. Tim wanted a shale look to the cave; and there were two precipices that he wanted to meet at a point, with a little gap between them. He wanted it weird — and we gave him weird."

Two separate batcave scenes required slightly different painting approaches. "One shot was an establishing view, a high-angle look at the whole setup," Mather explained. "Then there was another, lower angle looking up, which was a tighter shot. Bruce is working on the batmobile on the left precipice and the butler comes in from the right to this very precarious point. The different textures of the painting were established by the shale look of the live-action plate. There were a lot of intense blues and purples which were fun since I rarely work with those 'unnatural' colors. During the painting I had to keep in mind that the CG bats would have to play against something in the batcave, so there had to be some areas of light to give the bats something to silhouette against. I

also put a floating island of rock in the matte that was really strange because it tapered down — which is the reverse of what would happen in nature. The batcave was a total fantasy.”

The second batcave shot — in which Alfred the loyal butler discusses with Bruce Wayne an invitation to a Max Shreck costume party — had a technical problem that was of concern to Burton: a highlight on the edge of the precipices brought the points too close together. Since it was an original negative matte painting and the highlight was already on film, Mike Fink elected to fix the problem when the shot was delivered to Video Image for the addition of computer generated bats. “I sat down with Richard Hollander and sketched where the tip should be, the distance between the opening,” Fink stated. “It was a digital composite; so after the shot was scanned into the computer, Richard was able to paint out the tip by picking up some blacks in the background and painting them back in.”

Roaring out of the batcave to Gotham behind the wheel of his batmobile, the *Dark Knight* could rest easy in the knowledge that his vehicle boasted new superfeatures. Included among them was the capacity to transform into a batmissile which would take much of the batmobile action squarely into the visual effects realm. A sophisticated, computer generated shielding effect, rather than the cruder cel animation of the first film, would be another batmobile improvement.

Live-action shots of the batmobile would utilize the two prototype cars from the original film, plus a third one built for the new production. With their curved fiberglass shells built over customized chassis, the prototype cars used a built-in twelve-volt electrical system to power the effects. But for *Batman Returns*, Chuck Gaspar and his crew would have to retool the original vehicles to get them up to speed — literally — for the new production. “The two cars had been in England this whole time and were pretty wrecked,” Gaspar explained, “so we had a big problem trying to rewire and add all our apparatus. We had the suspension and transmission changed, the engine tuned up. It made the cars a whole lot quicker. The batmobile was going to be on Stage 16 most of the time, so it wouldn’t be able to get to speed unless we changed all the gear reductions. We jam-packed that thing so full of equipment it was like a nightmare inside. We had schematics drawn up as we went along; and even then we had problems because things would be changed during production from the first and second unit. Somebody might change the color of a wire and that would throw us off.”



For a shot of the batsignal against moving clouds — as seen by the Penguin from his sewer haunt — Matte World employed yet another multiplane effect. Sculpted dacron clouds were adhered to glass and fitted to a motion control mover, then photographed in conjunction with a skyscraper painting and projected batsignal. Effects cameraman Wade Childress and matte artist Brian Flora check the lighting on the setup.



Answering the call, Bruce Wayne descends into the batcave. As conceived by Tim Burton and Bo Welch, the batcave was a magnificent expanse of shale walls and harrowing precipices. Wide shots of the batcave interior were realized through stage sets composited into matte paintings that extended the cave to its full dimensions.

Integral to the new batmobile look would be the rocket motor exhaust effect. “Tim was not completely happy with the exhaust effect they had done in England,” Gaspar noted. “He wanted to intensify it, give it a violent jet aircraft look. For the exhaust flame, we used a kerosene heating element. There were six jets inside the rocket motor itself which atomized the kerosene; and when that was ignited, it created a red ball of fire coming out the back. We’d fill this little tank up with map gas and actually explode that out the back of the engine; so when it started up, it threw out a red ball of fire. When we were testing, we’d feed more air into the fire to get a hotter, faster flame. During a couple of our tests in the shop, it got so hot the heat transferred to the fiberglass body and scorched the batmobile. To prevent that, we put a heat reducing material inside and around the engine itself and then on top of the fiberglass.” Ten batteries were required inside the car to operate the various effects mechanisms. To get maximum power, inverters were used to jack the electric charge to one hundred ten volts. “The original twelve volts weren’t powerful enough to do what we wanted. We needed something with a lot of meat to it.”



Specific live-action scenes within the cave were shot on full-size set pieces built on stage at Warner Brothers.

When the Red Triangle Gang, costumed like freaks from a Halloween nightmare, descend on the Christmas shoppers of Gotham Plaza, the combat-ready batmobile answers the call to action. In one sequence, *Batman* performs an evasive counterattack maneuver using a special hydraulic device which drops from below the Batmobile chassis, hits the ground to hold the car in place for a hundred-eighty-degree turn, and blasts a pair of Red Triangle crazies with exhaust flame. To get the batmobile to turn in place, Gaspar and his crew rigged a pedestal three feet in diameter to be pushed down hydraulically from the bottom of the car, allowing the batmobile to rise up. There was a cut, the car was turned and then dropped back to the ground. Gaspar worked with the stunt performers to prepare them for the following burn shot. “We caught the guys on fire with the rocket motor flame. We just put flammable rubber cement over their clown suits. The stuntmen had pyrex glass lenses over the top of their masks so we could do a full body burn and not hurt them at all. We had a burn time of thirty to forty-five seconds; then we had to get them out and extinguish the flames with CO2.”

Although the *Dark Knight* successfully metes out his two-fisted brand of street justice during his encounters with the Red Triangle Gang, the psycho criminals get a little revenge when they discover the parked batmobile, seemingly secure in its protective cocoon shielding, and manage to uncloak and gremlinize it. The cloaking effect was provided by computer graphics artists at Video Image and was one of the prime visual twists on the updated batmobile. Tim Burton had been dissatisfied with the ‘magical’ quality of the animated cloaking effect featured in the first film, and for *Batman Returns* had requested a more reality-based, mechanical look.

About ten computer graphics shots were required for the cloaking and uncloaking scenes in the film. As conceived, the cloak was a heavy, high-tension steel shield hidden within the body of the car that could iris out, completely covering the vehicle. However, the design of the batmobile did not lend itself to the notion of such a hidden shield. The CG team of Joseph Goldstone and Stanley Liu

not only had to use their Alias software system to design a mechanical-looking cloak, but also had to provide logical moves for the emergence of the cloak parts from hidden sources within the car. “We had to deal with the fact that it was physically impossible for a cloak to come out of the batmobile,” explained Liu, who has a background in automotive design. “We had to invent a lot of new ways for these shield pieces to emerge. We tried to make it look believable and not like the cloak magically comes out of nowhere.”

Goldstone and Liu found that a separate support structure was also needed to give mechanistic logic to the effect of the shielding spinning into place. “This support structure wasn’t on the real batmobile, of course,” Liu observed, “it was there solely to help us make the cloaking plausible. In the case of the wheel cover, segments of the iris would otherwise appear to be floating in the air. What we did was invent mechanisms that would make the iris motion believable from the angle of the shot. The cloak was actually quite a complex shape — a series of compound corners and radii — and the Alias software gave us the ability to create that. The software is an interactive industrial design tool, so it’s meant to be used to design workable models. We basically took bits and pieces, building here and there, almost like a model kit.”

For the Video Image crew to be able to construct a cloak in the digital environment, on-set reflection map photography had to be taken from the viewpoint of the actual batmobile in all six directions — front, back, left, right, up, down. A full-scale fiberglass cloak built early in the production (and used in one live-action shot) also provided reference for constructing the cloak in the digital environment. “We try to model reality as much as we can,” said Goldstone. “We spent basically two nights shooting the environment maps and recording the reflections on the car. The director would call out a print take, and we would jump in and do our batmobile measurements. We’d measure where the camera and the car were relative to references that we drew up: the straight sidewalk edge, reference cracks in the sidewalk, and so on. Then, to help us lock things in, we had certain designated spots on the batmobile that we used as references, such as the hubcaps, the center of the top canopy, the little grill on the front, the center of the nose cone and the top back tips of the fins. On a printed take, we’d attach tiny lights to those reference points and have them roll a few feet before moving the camera for the next take. Later we’d scan and use this ‘reference take’ for 3-D lineup. For highlights and reflections, we would normally take stuff from the environment, the scanned-in imagery. Other times the environment just wasn’t strong enough and we’d have to paint in special reflection maps. We used the Symbolics XL-1200 paint system to prepare these maps and then used software written by Andy Kopra to convert the map from Symbolics format into something that the Alias system could handle.” The scanning of the interpositive containing the live-action material, digital compositing of the rendered cloak and the scanned IP, and film, recording of the digital composite represented the final steps in completing the ten shots.

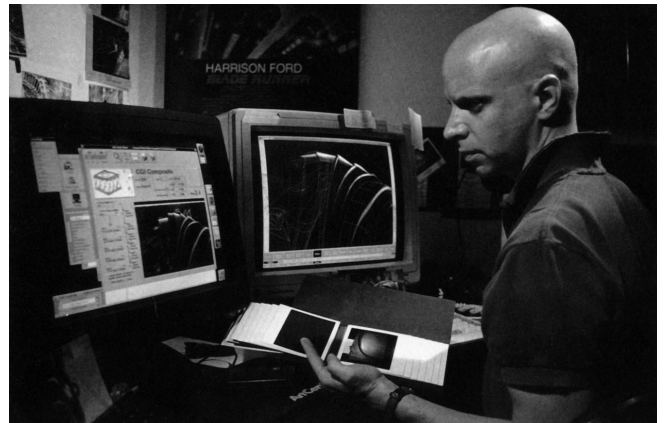
When the Red Triangle Gang manages to sabotage the batmobile, it is at an inopportune time for the Caped Crusader who, a victim of a Penguin frame-up, is suspected of murder and is being pursued by the Gotham police. As *Batman* drives off in his batmobile with the police on his tail, he discovers the Penguin is controlling the movement of his car, thanks to an override device planted by the gang. With the Penguin effectively at the wheel, the batmobile becomes a lethal weapon on the streets of Gotham, crashing into cars and sending them flying. “All the cars were cabled to pull them back,” noted Mike Fink, “and so on the set there was a forest of cables coming down which Pacific Data Images removed digitally. Luckily, we had a lot of things going for us — the scene was darkly lit and the background behind the wires was kind of amorphous.”

By the time *Batman* regains control, the car is roaring toward a narrow alley, seemingly on course for an inevitable collision. Suddenly, the batmobile begins to shed its mechanical skin, turning into the sleek, rocketing batmissile, which easily passes through the narrow alley, leaving the pursuing cop cars to crash in its wake. “It’s the kind of gag you’d see in a *Road Runner* cartoon,” observed Bob Skotak, whose 4-Ward Productions created the missile metamorphosis. The sequence would be accomplished in four-perf using quarter-scale batmobile sections for the filming of the specific shots. Required for the transformation was a rear view of the car’s center sections blowing out, a down-angle tracking move with the batmobile parts completely flying off, a shot of the side panels narrowing into the missile shape and, finally, a closeup of the wheels reconfiguring into a straight-line position.

The initial shot in the sequence, representing the first stage of conversion, was filmed on a miniature Gotham street set. “We photographed a quarter-scale miniature on a street set that was roughly fifty to sixty feet long,” said 4-Ward supervising director of photography Dennis Skotak. “The camera was on a dolly cart to which the batmobile was attached on a speedrail outrig. The cityscape background was pretty perfunctory, basically just a wet and slushy looking street we dressed on the sides with some quarter-scale cars and also a few background buildings. As the car



Two batmobile prototypes built originally for the first film were shipped from England and retooled by the CG Special Effects team. Among the improved features was a fiery rocket motor exhaust effect and a souped up engine that considerably increased the car’s speed and acceleration.



Also upgraded was the batmobile’s cloaking device. While the first film had relied on simple cel animation to realize the protective shield, the sequel would feature a sophisticated, computer generated cloaking effect produced by Video Image Associates. Starting with reference photographs of the batmobile, computer graphics technicians used the Alias software system, an industrial design tool, to model the shield in the digital environment. Working at a monitor, animator Joseph Goldstone renders a section of the batmobile shield.

traveled along on cue, a section of the cockpit was blown off with air pressure. Because it was a miniature, we were overcranking — so it had to be done quickly and all the cues had to hit their marks.”

For successive shots in the sequence, 4-Ward would develop in-camera means to maximize set space while still maintaining the illusion of the vehicle rocketing along the midnight streets. To film the car’s front fenders flying off, a quarter-scale model was placed on a treadmill and filmed from the front. “Because of the long travel distance required and the little space to shoot in,” Dennis Skotak continued, “we used the treadmill which caused the tires to rotate. The fenders were pulled off with levers and air pressure from an airline that was attached to the inside of the model, which also threw off debris, glitter and a little bit of fuller’s earth. We also used the treadmill for the shot where the wheels moved to in-line position. It had to be engineered — in this case by Lee Stone and Jim Towler — in a very peculiar way to make the pieces fit. We went to a simple rod arrangement. We operated from behind the wheels as they were being rotated by the treadmill, and we’d pull the wheels into their position by pulling levers while the miniature was in motion. In this particular case, we actually undercranked the shot. We did some tests down to four frames per second; but the final in the film is in the range of eight frames per second. At that rate, it had a very positive, locked-in-place look.”

In addition to the briefly glimpsed city street backgrounds, a number of subtle touches were incorporated for authenticity. “We introduced camera shakes so it felt a little more alive,” Skotak continued, “but we also had to be careful because it had to be stable. If the batmissile were real, it would be a large, heavy vehicle that would be stable because of its weight. But our miniature was made of fiberglass and had only limited mass; so it had to be held down in place, otherwise it would tend to bounce — which you see in the kind of effects films where the army tanks go bouncing across the countryside like toys. We also added touches like mist blowing by, as if the vehicle was driving over sewer grates that had steam coming out of them.”

For the down-angle shot of the batmobile completing its transformation into the batmissile, another larger treadmill was considered — again to create a sense of speed and travel in a limited space. The treadmill idea was quickly dismissed, however, because of the complexity of showing the entire vehicle shedding body parts as it sped away. 4-Ward came up with a solution which, at first, seemed like a wild shot in the dark. “Rather than building the roadway as a miniature or using some expensive flying rig,” Dennis Skotak commented, “Bob created artwork of a Gotham street as seen from directly overhead. We photographed it and stripped it together to form a long transparency that we could pull through a transparency projector as a continuous piece, projecting it onto a front projection screen. So we did this particular shot vertically, with the camera turned sideways to get the correct angle. We mounted the miniature car, also vertically, with a motor inside it to rotate the wheels. The model was mounted literally a fraction of an inch in front of the vertical front screen projection element of the roadway artwork. Mounting the vehicle vertically allowed the fenders and pieces of the car to fall off with the help of gravity, and to look as though the pieces were falling behind on the road. Creating the roadway as a front screen projection enabled us to have a stretch of road longer than we might have been able to create any other way.”

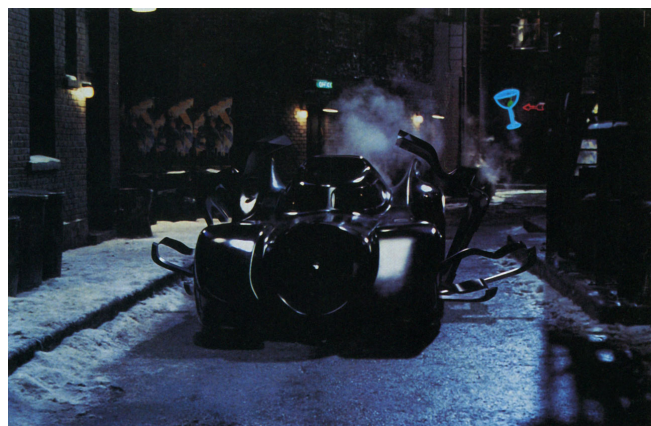
Since the shot was a tracking helicopter POV, the crew also added effects of the city structures passing between the camera eye and the speeding car below. “Gotham features a lot of powerlines

and girders and crossover trestles between buildings; so we emulated that by putting in dimensional overhead crossway pieces that we lowered on another mover rigged to drop between the camera and the car at a fairly high rate of speed. We also put lights on rigs and had them drop past the car from the front to the back end, deliberately spilling light on the front projection screen, which is something you ordinarily wouldn't do. But just that right amount of spill light caused the model to cast shadows on the screen which provided a feeling of interaction with the projected image. Since we were doing this all in-camera, we could also impart the helicopter POV shaking. Although today's helicopter mounts provide very steady images, camera shake creates a lot more excitement."

A shot of the batmissile rounding a sharp corner required a more expansive miniature set featuring background buildings and foreground structures. "Modelmakers Chandler Group, Doug Moore, Pat Denver and artist Rick Rische built a quarter-scale miniature set that was roughly twenty-five feet on the side with a view of buildings up to the second story, at roughly twelve feet tall," Dennis Skotak said. "The missile had to round the corner very quickly, riding on a single track driven by in-line wheels, like a motorcycle. Even though this was a make-believe vehicle, it still had to do what a real vehicle would do, which was lean as it went around the corner with the rear end sliding out a bit. We had to exaggerate all these moves because it was very hard for the camera to detect the lean — the missile was shaped almost like a hot dog and you can hardly tell if a hot dog is leaning! The miniature also weighed forty to fifty pounds and required fine-tuning by the crew because its centrifugal forces tended to pull the track apart. To hide the track, we laid a rubber membrane over it, dressed to the level of the street so it was all one level. We then cut a slit for the missile to ride through. The slit closed right behind itself as the missile went through, so you couldn't see it. Our low angle, and the fact that the street featured a lot of slushy ruts, helped disguise the gag."

The batmissile sequence was originally designed to end with *Batman* speeding through the narrow alley opening as police cars crashed behind. But Tim Burton asked 4-Ward to come up with a more dynamic conclusion — the batmissile rocketing out into the horizon of Gotham's industrial waterfront district. "I made a sketch which I showed to Tim and he liked it," Bob Skotak recalled. "It was a pretty wide vista that showed a somewhat more industrialized part of Gotham City that tied together the backlot location facades they used for the live-action of the police cars chasing the batmobile. The chase was away from Gotham Plaza and the business district, and this warehouse-type industrial area down by the river was less exotic than some other parts of the city. I was basically given a free hand to design and paint the entire shot, which was nice."

To accomplish the shot required blending together the two separate elements of the locked-off batmissile miniature action and Bob Skotak's expansive waterfront district painting. "We created a road section that was almost one hundred feet long, put a quarter-scale batmissile on a wire pulley system, and shot a locked-off plate with the camera turned sideways — since the area of action was essentially a vertical composition — to maximize the picture area," Skotak explained. "We shot in four-



perf, but were able to generate a 'Vistavision'-sized plate by panning our four-perf camera to photograph the other half of the set as a single stationary frame, since there was no action occurring on that side. We got our Vistavision field of information by projecting and blending the two images together, side by side.

This combined image of the wide roadway leading into the distance was projected onto a white screen and beam-split into a blacked-out matching area of my painting of the city. Also via the beamsplitter we added reflection effects for the river by means of a 'rotating string' gag devised by Joel Steiner, and some blinking city lights. Overall, the shot was filmed motion control, starting off close on the missile as it first entered the shot and then zooming back and tilting up as it rocketed away."

With *Batman* on the run, the Penguin and Catwoman form a brief, shaky alliance. As a counterpoint to the Catwoman's lithe, acrobatic athleticism is the Penguin's feral cunning — and a penchant for nasty trick umbrellas, his weapon of choice ever since the character's first comic book clash with *Batman* back in 1941. Burton's Penguin incarnation, while more misanthropic and psychotic than the waddling, Shakespeare-spouting comics character, still carried with him those trademark trick umbrellas. One scene featured a whirling-blade umbrella airlifting the Penguin from the ground, helicopter-style. The gores fly off and the umbrella begins spinning, lifting him into the air. DeVito himself was trussed up for the effect by Chuck Gaspar and his crew. "We had an apparatus hooked up behind the set which actually picked him up through a metal strap that was around his waist," Gaspar explained. "It was like a levitation system, with a forty foot aluminum track on wheels. An arm would come out through the wall and pick him up. The camera had to follow him up at just the right angle so as not to see the mechanical arm coming from the wall to his body. We got the umbrella itself to spin by vacuforming some pieces to hide a tiny, gear-driven motor. Once the umbrella started spinning, we manually tripped an apparatus which ran from the ceiling to these little pins. Once they were tripped, the gores flew off in all directions."

On the first flying umbrella take, the effect did not go as planned. The counterweight of the backside of the arm was not balanced with DeVito's weight, and the actor was left suspended forty feet above the stage while Gaspar's crew worked to add the necessary weight. Much to the surprise — and relief — of the effects crew, the actor took the small gaffe in stride. "DeVito was joking the whole time we were fixing the problem," said Gaspar.

"He was telling jokes up there for about twenty minutes. Then we fixed it, he came back down and said, 'Thank you very much — see you down the road.'"

The brief team-up between the Catwoman and the Penguin ends when a leering pass from Cobblepot meets with snarling feline rejection. The wounded Penguin responds by hooking his umbrella-copter around the Catwoman's neck, lifting her into the night sky. To provide the feeling of scale, the shot had Catwoman flying behind the sheer Gotham Plaza skyscrapers and then out and away, moving into the horizon through a tunnel of city lights before the umbrella releases her to what would be a fatal fall for anyone not blessed with cat lives to spare.

Revised by the author for the book, the graphics team was consulted in the book regarding the specific shot. A series of slightly overexposed black and white photographs of DeVito were taken and then a black and white photograph of the batmobile was taken and then recorded on film.

The scene, created at Boss Film, would be one of the visual centerpieces of the film and one of only a few wide shots of the Gotham metropolis. The shot required a bluescreen element of a stunt *Catwoman* composited optically against a multiplane Gotham skyline that combined a miniature model foreground and a matte painting background. “For the Gotham flyover,” John Bruno explained, “I wanted to do a three-dimensional shot — a pan and truck across this full-sized model with a multiplane painting in the background. Multiple layers of miniature buildings were added in an attempt to open up the whole city. For this particular shot, Neil Krepela used a 65mm camera to shoot Michelle Pfeiffer’s stunt double in front of a bluescreen so that we could use the ZAP (zoom aerial printer) to reduce her as she drifted off in perspective across the city.”

A computer generated flying umbrella was also produced by Boss and composited into the shot. The real umbrella which the stuntwoman had held onto during the live-action — which had been intended from the beginning only to be used as reference for its computer generated counterpart — was rotoscoped out by Nina Solerno. “The umbrella was rebuilt in the computer,” stated Bruno, “and match-moved with *Catwoman*. The umbrella and *Catwoman* element was then scanned onto 65mm film for eventual compositing with the matte painting.”

In setting up the painting that would be part of the multiplane effect, art director Brent Boates and matte artist Michele Moen had to incorporate director of photography Garry Waller’s motion control camera moves on the foreground plaza building miniatures. “We actually ended up tracking, frame by frame, to match the painting with that miniature move,” stated Moen. “Alan Harding shot a latent of the miniature, panned their move, and then we bipacked it to see if the painting would work with the camera move.”

The matte painting itself was a brooding vision of the dark, doomed city, with a tunnel of city lights and white drifts of steam and smoke that moved along *Catwoman*’s aerial path. Two paintings were required: an outline of distant skyscrapers beyond the rotating rooftop Shreck cat head, and a wide shot featuring the tunnel of light effect to the right of a miniature building which served as the foreground structure. In addition to the two matte paintings of the distant city, a separate smoke element and a foreground glass painting were required to accomplish the multiplane effect. “The way the shot works,” said Moen, “the camera is following *Catwoman*, so it pans and pushes in. The one foreground multiplane painting moved at a different rate on the camera stand to get the right perspective shift in relation to the background painting.”

Guiding the flying *Catwoman* — and the audience — toward the distant, unreachable horizon was a stream of smoke and city lights. “*Catwoman* was the focal point,” stated Moen, “and we led that point down with a path of twinkling, blinking lights she could follow. For the lights, I just poked holes in black glass. That was a separate pass that we composited before we gave the shot to optical. There was also a separate smokestack smoke element that we rear-projected and then burned in. I think the most difficult part of the painting was getting the scale right, working with the camera. At first we started with smaller paintings, which got bigger until we were almost running out of room on the easel — they were both about six-by-three-feet. The two paintings were divided by a miniature building in the center. Roto made a split-matte through that miniature to tie in the paintings, because they were both shot separately.”

Thinking he has effectively declawed the *Catwoman*, the Penguin brings chaos to the Christmas tree lighting ceremony in Gotham Plaza. The key action scene features a shot of the Penguin as he watches the holiday observance and the plaza full of shoppers. Similar to an earlier shot of the Penguin's sewer-level POV of the bat signal, this shot would require a Matte World foreground Vistavision bluescreen element of the Penguin's webbed hands gripping the bars. The foreground element would then be optically composited by Video Concept Engineering with a live-action background and a latent image matte painting that extended the plaza buildings skyward.

At the crucial moment of the tree lighting, a flock of bats — at the behest of the Penguin — suddenly flies out of the tree, swooping down on the unsuspecting crowd. All the bats throughout the film — from the screeching flocks in the sewers and the batcave to those in the plaza attack — were computer graphic creations of Video Image. While the facility's batmobile cloaking team had produced a mechanical-looking effect that operated with some structural logic, bat animator Andy Kopra was tasked with creating organic shapes that looked real and often interacted with live actors.

Richard Hollander who oversaw the Video Image CG effort and was responsible for the scanning and compositing of the imagery, had directed his department to render realistic bats even from the start of the design phase. "Rather than create wire-frame things flying around for the director to view, we felt it would be more efficient to give him fully rendered bats — at least as close to a final as we could get," Hollander explained. "The shape, size, color and motion blur had a lot to do with the dynamics of the bats. They're so abstract that as soon as you take away even one little bit of detail, they don't look like bats anymore. So I realized early in the ballgame that we couldn't isolate any one thing. We were going to have to effectively deliver fully rendered images for all takes."



Video Image was also responsible for creating swarms of computer generated bats for several sequences in the film, including the opening titles and scenes in the batcave and in Gotham Plaza. Unlike the cloaking effect which had involved strict mechanical parameters, the bats were organic shapes requiring random, lifelike movements. Andy Kopra, who rendered and animated the bats, studies one of his shots.

Creating the flying creatures required an extensive amount of hardware and software. A Symbolics XL-1200 computer was used to program the specific bat behaviors for each shot, while the actual animation utilized the 'Boids' program, a behavioral animation system. "The Boids software system defines what it means for birds or bats to fly in a group," said Kopra. "It allows them to fly, avoiding obstacles and each other, but still have goals for behavior and direction. In the Christmas tree shot there was a sense of the bats swirling around, while in other shots they had to appear to be attacking people." Another important piece of software was Pixar's Photorealistic Renderman. The position and orientation data generated by the Boids system was saved as files of transformation matrices, then used as input to the Renderman scripting system to produce the bat image files. These images were then composited with the scanned background elements. All together, Video Image would create flocks of bats for twenty-two separate shots.



Framed for murder and on the run from police, Batman outmaneuvers his pursuers by transforming the batmobile into a batmissile — a near-cylindrical rocket machine. 4-Ward Productions created the effect shooting the various stages of the conversion from batmobile to batmissile in miniature. An initial shot, showing center sections of the car blowing off and dropping onto the pavement, was filmed on a quarter-scale street set, as was a later shot of the batmissile rounding a corner. Doug Moore and Pat Denver finish painting and detailing the most elaborate of the street models.

For the Penguin's Christmas tree surprise, Kopra approached the digital compositing of the scene in spatial terms to create the illusion of the bats coming from within the thick branches of the live-action tree. "By using a matte for the Christmas tree," Kopra explained, "the bats could appear to begin their motion behind it. The bats in front of and behind the tree were rendered as separate images. They appeared to move through the tree because I matted out the part of the flock that was behind the tree with the tree image. The speed of the bats and their size in the frame helped to maintain that illusion." Controlling the bats entailed making adjustments to flock characteristics defined by the software. "The simulation of flocking behavior consists of a set of general rules that all the bats follow. For example, the flock tries to stay together, but individual members try not to bump into each other. For each shot, however, changes are made to individual bat characteristics, like their maximum speed and their current target. Animating the bats consisted of changing values like those, as if I was turning control knobs on robot bats. Making those changes was the directorial part, getting them to behave the way I wanted."

While the Boids system generated position and orientation data for the flying maneuvers, the creatures themselves were given shape and form by Photorealistic Renderman. "The bat models were designed from the profile of a bat's wing," said Kopra, "which consists of a shortened thumb, four fingers and the skin that stretches between them. An outline was developed from that form and rotated into a number of positions for the flapping motion of the wings. Cross sections from those positions generated the three-dimensional model. I wrote software to take those bat models, as well as the position and orientation data from the flocking simulation, to produce the input required by Renderman to generate an image of a flock of bats in motion." To add to the terrifying

impact of the bats, particularly in closeups, the size of the bats was scaled to more than a foot. Throughout the film, the bats were rendered with motion blur to provide a more realistic look. “The simulation provided the beginning and ending positions for the bats for each frame, and the renderer motion-blurred between them.”

All of the computer generated bats in the film were composited digitally by the Boss digital department. “As far as I know,” said Mike Fink, “this movie marked the first time that shots generated by different effects houses were transferred between those houses digitally — without even a single piece of film exchanged. Richard Hollander created eight-millimeter computer data cassettes — which are the current coin of the realm — to move computer data from one machine to another. He would output his bats to the data tape and then give the tape to Jim Rygiel in the Boss CGI department. Jim read that into his computer and composited the shot.” One of the challenges of compositing the shots was that the film was quite dark. “It was set at nighttime and lit almost entirely with blue light — and the tonal range between blue and black is pretty limited. Scanning and compositing shot after shot that was in that tonal realm was a learning process for all of us. Luckily, the turnaround in CGI is so fast that we were able to go through many iterations of these composites and try many different things.”

Prior to the Penguin’s release of bats from the booby-trapped Christmas tree, the film featured an over-the-shoulder shot of *Batman* looking down, gargoyle-like, from his perch on the rooftops overlooking Gotham Plaza. Rather than shooting it as a traditional composite element, Boss created the shot in-camera, placing a stunt actor against their miniature Plaza structures in an extreme version of forced perspective trickery. A similar forced perspective effect would be used in a scene where a Penguin umbrella releases bats that force the *Ice Princess* (Cristi Conaway) — a beauty queen snow bunny whose function is to decorate the plaza tree lighting ceremonies — to take a fatal rooftop plunge. “We did a crude test early on with a boom arm holding a stand-in for the *Ice Princess*, myself and the camera above the miniature in the background,” said Garry Waller. “From that we saw that we could both light and hold onto her for the shot. So we rigged a crane for Cristi Conaway to lay down in. I was literally straddling her from above with a handheld Vistavision camera as the crane boomed down into the set. I went with her, filming at six frames per second. We used an air ram that forced air up from below and made her hair fluff straight up as if she was falling. We had to be careful not to let any of her shadow cross the miniature structures. In fact, the final shot was designed as if she was falling out of the darkness and into the lights of the plaza below. So it was lit darker at the top. As she dropped from the building, a lighting dimmer made it brighter the further she fell.”

Computer generated bats were also added to the beginning of the forced perspective shot. “They were mostly just a motion blur,” said Fink, “but if they weren’t there, the shot would have jumped like crazy. It was very subtle.” To add layering to the CG bat attack, Fink brought in Optic Nerve to rig mechanical bats onto select members of the crowd, as well as the *Ice Princess* prior to her fatal fall. “Optic Nerve ran a wire from the belly of the mechanical bat through a slit in the clothing to a molex connector attached to an undergarment. The most effective use of the mechanical bats was when the *Ice Princess* was on the ledge. We put one on the back of her hand and had her run her hand through her hair trying to remove it.”

A different camera look — one consistent with the wide shots used for the above-the-rooftop action — was required for the forced perspective over-the-shoulder shot of *Batman*. A batsuited stuntman was set in a lift that took him twenty feet in the air, just above the thicket of Gotham Plaza miniatures. “There was a rail and he’d lean over and look down, cocking his head to get just the right eye-line for surveying the Plaza,” Waller explained. “We set him up based on the initial tests we had done with the *Ice Princess* forced perspective shot. Based on that shot, we knew that we could hold depth of field. We could look through the camera and tell whether it was going to work or not. We’d set him up while looking at a video playback to see how he was looking in relation to the miniatures.”

It was not until the shot was cut into the film that Mike Fink realized the action would work much more effectively if the shot was printed in reverse. “John Bruno picked the most likely take — out of twenty-five or so — and Boss’ optical department did a reverse print reduction,” said Fink, “which proved to be a great improvement over the original shot. It was another case of subtlety carrying the day.”

A highlight of the rooftop action was a shot in which *Batman*’s cape opens to full wingspan and is pressed into service as a hang glider. As the bats are released from the Christmas tree, the *Dark Knight* unfurls his cape, turns and leaps from the rooftop, swooping down over the terrified crowd in Gotham Plaza. Rather than go through the arduous task of rigging a live person and flying him through the Stage 16 set, the production called upon Boss to create a flying *Batman* puppet that could be shot bluescreen and composited over the plaza footage.

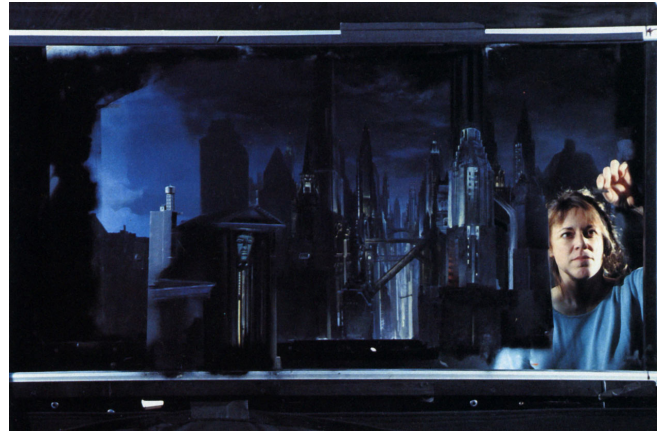
Laine Liska sculpted the puppet, while Craig Talmy worked on the armatures. “The puppet was made of a rubberized fabric laid into a hollow form put over the armature,” said Liska, “with the glove, boots and head done separately. It was suspended on wires with two rods coming out the feet, some two-and-a-half feet out the bottom.” The body armature created by Talmy was steel and lead with articulated knee and elbow joints. The weight of the figure was important to the rigging. “Our rigging system required the figure to be heavy so it wouldn’t wiggle when it was puppeteered,” Talmy noted. “As a hand-rod puppet, it was very susceptible to jiggling. The rods were the only way of controlling the puppet while it was on its rig.”

Because the puppet was to be hand-controlled with rods, there was concern that it would not synchronize exactly with the live-action background plates. In order to retain the superior animation achieved with hand-controlled puppeteering, while at the same time ensure the precise synchronization of motion control, a combination of the two techniques was employed. “I came up with the idea of hanging the puppet on pulleys from the ceiling to motion control commands on a turntable,” said Talmy. “By rigging the puppet with wires through its chest and connecting it to a pulley above and a pulley below, it could be tightened down so there was no forgiveness at all in those wires. Also, by suspending it by the pulley, we wouldn’t have to fight the weight. And we wouldn’t have to worry about what angle we were supposed to be in at what time because that would be done by the motion control computer.”

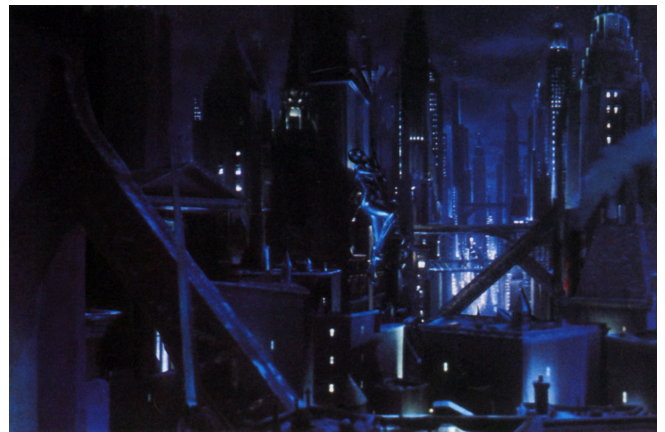
The rig itself was the stuff of backyard effects magic, assembled in a down-and-dirty guerrilla effects fashion with parts from a bicycle shop. A bike wheel and ball bearing rig was attached to a ceiling beam of a Boss shooting stage and connected to a rotating platform below. Perched on the platform, Talmy could work a pulley wheel to give pitch and banking motions to the puppet, while Laine Liska provided the performance by working the puppet rods as puppeteer Doug Miller manipulated the collapsible wings. The platform was set between a bluescreen wall and the intersecting motion control track where Garry Waller could move in with his motion control camera. "The platform we sat on to manipulate the puppet was sturdy steel and wood with a circumference of six feet," Talmy noted. "With a two-hundred-to-one gear reduction inside, the motor could spin at two hundred revolutions and we'd only get one revolution out of the turntable and a sense of articulation. As the camera came at us with its computer-driven move, the turntable would start to turn. Garry let the computer control it, just took it frame by frame on the background plates and positioned us frame by frame to match the background plates."

Swooping down into the plaza, the *Dark Knight* stakes his claim to Gotham by exposing the Penguin as a criminal. Having made a vain stab at legitimacy with his run for mayor, the Penguin is now forced back to his subterranean kingdom where he plots revenge with his army of penguins. The surreal bird horde would be realized by an artful mixing of Boss computer generated birds, puppet penguins created by Stan Winston Studio and three species of living penguins.

The computer generated penguins produced by digital effects supervisor Jim Rygiel and his team would be used primarily as background elements and for crowd scene effect. For the Boss CG department, the major challenge of the work was seamlessly blending the digital penguins with the real birds. "To create the penguins, we started with an Eadweard Muybridge videotaping session using real penguins walking on gridded backdrops here at Boss," John Bruno explained. "After noting their movements, we worked with a bird flocking program that was basically the same one used for the CG bats." Andrea Losch was responsible for creating the initial walk cycles, while the basic



Briefly united against Batman, the Penguin and Catwoman break their alliance when the Penguin makes an ill-advised advance. Angered by her rejection, the Penguin hangs Catwoman from one of his flying trick umbrellas, sending her up over the Gotham skyline and through a tunnel of city lights. To achieve the sequence, Boss photographed a bluescreen element of a stuntwoman which was composited with a multiplane shot featuring both foreground miniature buildings and a matte painting background rendered by Michele Moen.



A separate smoke element was composited into the shot to add atmospheric haze, while city lights were effected by backlit holes in black glass. Boss' zoom aerial printer was used to reduce the Catwoman's image in the shot as she drifted off in perspective across the sky.

flocking program was customized for each scene by Paul Ashdown. The next task was to model a realistic looking penguin in the computer. “In CG, we created a wire-frame penguin model and did some interesting business with it, making it walk around and bob its head. From that point, we wrapped color and a surface around the wire-frame form. Each penguin we created had its own programmed path and stopped, started, turned left or right based on that program.”

Mike Fink was more than impressed with the computer generated penguins. “We could have gotten much closer to them, they were so believable and the animation was so close to what the real penguins did. Each penguin was animated for head, body and flipper movement, and speed of walk — all random movement from one penguin to the next. One of the difficulties in creating the penguins was that, unlike the bats which had limited dimensional restrictions, the penguins had to be rooted to the ground. So we had the randomness of the Boids flocking program, but with restrictions imposed on it.”

Since real penguins were sometimes difficult to direct — the original ‘bird brains,’ according to one observer — it was evident that the Stan Winston puppet penguins would be the most controllable element of Burton’s wild kingdom. The mechanized penguins would be particularly vital for the climax of the film in which the penguin army marches on Gotham and launches pay-loads of rockets strapped to their backs — a stunt too dangerous for real penguins and too time consuming to construct in the digital environment. The order form for Winston’s puppet makers called for thirty mechanical penguins as well as six articulated puppet suits for the omniscient elder penguins that would be played by little people. As with their digital counterparts, the puppet penguins would have to blend in with the live penguins. “For the animatronic puppets, we had to duplicate three different kinds of penguins,” Stan Winston noted. “We produced ten puppets for each of three penguin species: eighteen-inch blackfoot penguins, and then thirty-two and forty-inch king and emperor penguins.”

While the art department oversaw the basic design and visual aesthetics of the puppet penguins, Richard Landon and Craig Caton coordinated their construction in the mechanical department. “The three different sizes of the articulate puppets were sculpted over a sculpting armature,” explained Landon. “The art department varied the sculpting a bit so they wouldn’t look identical to each other, although we used the same vacuform shells for all of them. Once we got a finished mold, we went back into the negative of the mold and laid in our thickness of clay and poured out the solid plaster positive in two halves that had anywhere from a quarter-inch to an eighth-inch gradation. We sent those to a vacuforming company that would then fill those vacuform cores. We brought them back to the shop, cut them in half and seamed them together, covering the bodies with fur cloth and segmenting the cores as necessary. The necks were slid into a series of half-inch bands that were then tied back together with elastic; so as the head bobbed it would expand and contract.” The art department also made fiberglass underskulls, the beaks, and all the sub-assemblies before turning the puppets over to the mechanical shop.

Some license was taken in the penguin design, such as the furrowing of brows on select puppets. “There were furrows on the brows specifically for the elder penguins and others that were designated for closeups,” said art department coordinator Andy Schoneberg. “Real penguins don’t have furrows; but the elder penguins were supposed to be a little more intelligent, so we reflected that by giving them more expressive abilities. We also had to modify real penguin anatomy to make

the suits fit over the actors. Little people are proportioned so that their heads are roughly the same size as ours, even though they're about half our height; so it's not a true proportional thing. So there were a lot of drawings and seat-of-the-pants sculpting and judgment calls between us and the mechanical shop to make sure there was clearance between the head and the outside of the costume. It is actually more complex to make a suit for a person than it is to build a puppet."

Another modification was the use of fur, rather than the feathers that constitute a real penguin coat. "There was no way to do the suits with feathers and have them look right," Schoneberg noted. "They would have looked ratty. The fur actually ended up looking more like penguin feathers." While the sculpting and vacuforming phase was going on, fabric specialist Karen Mason spent about two months researching materials with Natural Hair Technologies before coming up with a fake fur that meshed a variety of fur styles and weaves. "There were multiple grades of fur woven into the same fabric," explained Landon, "so it had different densities at tips and base. The fur came in white, and we had to have it custom dyed for the black areas. We also needed different thicknesses of fur — shorter fur across the head, longer across the back. The foam latex portions of the face were sprayed with a light adhesive and then flocked with pieces of fur." The subtle blending of coloring was another important detail. "We used colored markers to create the yellow and rouge tones of the head in a really slow gradation. If we had just put in yellow fur and orange fur, there'd have been a sharp line and it would have looked terrible — like a dime store display."

Each of the thirty animatronic puppet penguins required some one hundred ninety-four mechanical parts — nearly six thousand for the lot. Ten cables per penguin were also required for operation. "Each of the penguins was equipped with two joystick controllers," Schoneberg explained. "One controlled the head movements, the other controlled the neck movements. There was also a thumb switch on one of the controllers that made the neck stretch up and down — which we felt was pretty important because real penguins do that stretching movement a lot with their heads. Then there were two radio controls for various functions for each puppet. One of the radio controllers worked head functions, eyes and beaks; the other controlled both left and right wing movements. The remote control stuff was basically broken down the same way for the suits, although the little people provided all the gross movements."

Biding his time before releasing his avian army, the Penguin steps up his terrorist attacks on Gotham, beginning with a kidnap plot against Max Shreck's son Chip in retribution for the mogul having betrayed him. He finds his victim at the Shreck Building where Gotham high society is attending 'Max Shreck's Max-squerade Christmas Ball.' Among the costumed couples waltzing under the grinning Shreck cathead hanging from the ceiling are Selina Kyle and Bruce Wayne — appropriately, the only couple *not* wearing masks. Selina has come armed with a small derringer that holds a bullet meant for Max. Just as Kyle and Wayne realize each other's secret identity, a Penguin missile literally crashes the party.



As the Penguin wreaks havoc on a tree lighting ceremony in Gotham Plaza, the Ice Princess (Cristi Conaway) takes a fatal plunge from a skyscraper rooftop. The fall was a forced perspective shot, with Conaway on a special crane developed by Boss and rigged to boom down into the plaza miniature. Garry Waller, riding on the same rig, filmed her descent from directly above.

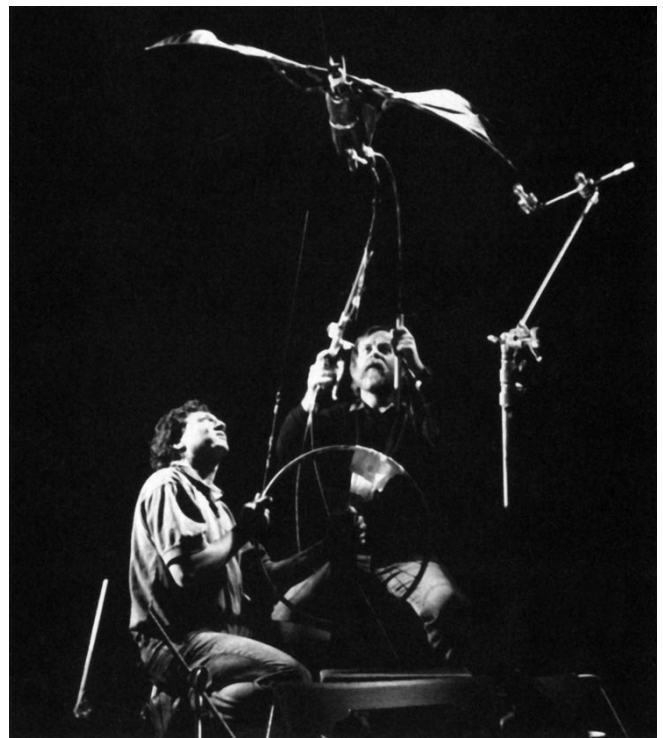
Super criminals have been busting up high society Gotham gatherings in the *Batman* comics for more than half a century, but translating the typically comic book visuals of the live-action bomb blast — which featured the ballroom dancers being blown skyward as the dance floor exploded — would tax even the considerable ingenuity of Chuck Gaspar's special effects squad. "I was more concerned about this one job than any other part of the whole picture," Gaspar admitted. "It was a dangerous, dangerous move."

A sixteen-foot-diameter area of the dance floor set was designated ground zero — or what the crew called 'the hole' — where the pyro work was set. To achieve the illusion of the dancers being blown upward by the blast, Gaspar's crew rigged a system of pneumatic cylinders that were hooked to stunt couples from a grid above the stage. "These cylinders were like cables that went back to the high side of the stage wall," Gaspar explained. "The cables were about an eighth-of-an-inch in diameter and about thirty feet long, and were powered by air driven compression. We need a very high-pressure zap to get them out of the hole real quick." The cables were attached to form-fitting harnesses worn by the stunt performers. The harnesses ran from the legs over the chest, strong and snug enough to keep body and soul together for the high-speed ride out of the hole. "The cables actually snapped them away. We timed it so that we detonated the dance floor once their feet were about fourteen inches off the ground."

The actual explosion entailed electronically detonating tempered glass to produce an opening for the big blast to follow a mere millisecond later. "We had three cues," Gaspar explained, "pulling the stunt couples back, electronically breaking the glass and blowing up the floor. We didn't shoot off the explosion until we saw the dancers start to move. Once the cables pulled their bodies out of the hole, some of them landed as far as fifteen to eighteen feet away. Since the cables stretched to the high side of the wall, they were actually being pulled back and



To provide subtle movement to high-angle shots of the chaos in Gotham Plaza, nonarticulated puppets attached to wires were pushed and pulled from off camera. Modelmakers Monty Schook and John Merritt position the figures on the plaza miniature.



Watching the horrific scene from a Gotham rooftop, Batman opens his cape and swoops down over the crowd. Rather than face the logistical nightmare of flying a stuntman through a full-size set, the production opted to

up at the same time. Even though we had established through testing where everybody would go when they were yanked back, and we tried to pad all those areas, a lot of people still got slammed against the wall. Fortunately, nobody got hurt — just a couple of scratches.”

realize Batman’s flight with a puppet built and operated at Boss by Laine Liska and Craig Talmy. An inexpensive bicycle-parts rig provided the gross movements, while Liska produced the more subtle animation manually via rods.

The exploding dance floor scene required more wire removal work by Pacific Data Images. Unlike the batmobile crash sequence — which was simplified by the amorphous background of the shot — the dance floor was well lit and full of complicated background elements. “There were wires going past a balcony with musicians on it and a lot of architecture,” noted Fink. “PDI did a great job — some of the wires were extraordinarily hard to find. One of the things I always recommended on set was to paint the wires day-glo orange. But nobody ever wants to paint wires orange because they feel that the wires *may not* be visible if they’re black. The orange paint forces you to use some wire removal technique. Everybody was convinced that we wouldn’t see the wires on the dance floor. When that turned out to be wrong, PDI had to remove them.”

Much of the action — from hand-to-hand combat to explosive pyrotechnics — involved fight sequences between *Batman* and *Catwoman*. One rooftop encounter between the Bat and the Cat involved both set work and a Boss optical composite effort. In the scene, *Batman* hangs from a ledge at the end of *Catwoman*’s whip, dangling far above Gotham Plaza. The shot required a foreground set piece of Michael Keaton hanging some fifteen feet above a front projected bluescreen placed over stunt pads. Included in the composite were Boss miniatures of the Gotham cathedral and the Shreck Building. “Once we had the bluescreen footage of Keaton hanging from the ledge,” said Fink, “we had to compose the background miniatures to match in perspective the angle we had on him. That wasn’t a problem — it came out matching the storyboard nearly exactly, and it looked quite good — but when Tim saw it he asked us to reposition the background. We lost some of the visual clues that helped tie *Batman* into the background, so the composite became a bit more difficult to complete successfully. But Boss pulled the shots together — largely due to Michael Cooper, their optical lead on the show.”

The rest of the fight scene, as well as other rooftop scenes, required a special set built on a separate Warner’s soundstage. The set, which also included Selina Kyle’s apartment, featured some fifty permanent structures built into the perimeters of the soundstage, complemented by eighteen wild rooftops of different sizes that filled the soundstage’s central area. “The whole rooftop set was very dense and romantic,” Bo Welch said. “Basically, the perimeter consisted of a lot of buildings of manipulated scale to get some depth. Selina’s apartment was built into the perimeter as a permanent set so we could look into her apartment from the rooftops and vice versa. The wild rooftop pieces were sliced out of various heights and set on wheels so we could move them around. The buildings were all wood frame construction — with a little bit of steel to reinforce them — with plastic brick, lathe, plaster and paint for detail.”

In contrast to their rooftop encounters is a street-level meeting in Gotham Plaza where the *Catwoman* cartwheels to a confrontation with *Batman* moments before a bomb she has set rips through the department store of her hated former boss. For the live-action pyrotechnics, in which display windows and revolving doors blasted outward on the Stage 16 set, Gaspar and his crew set

down some eighteen mortars in the interior lobby, camouflaging the explosives with Christmas decorations. A combination of explosion mortars and map gas mortars provided the blast. “Map gas is a stabilized, settling gas that gives you a lot of flame,” Gaspar explained. “The gas was in big mortar holding tanks; so once it was released and it ignited, we could control the fire. We could blow it ten feet, twenty feet, five hundred feet if we wanted.” As with the pyro work for the exploding dance floor, the Shreck department store windows were blown out by detonating tempered glass. “We used a little detonator wired to a battery — the same setup as any basic bullet hit effect. Since we had a lot of glass to break at one time, I brought in a big generator to make sure we had plenty of current going.” For the big explosion on the set — which would be rebuilt later for future filming — the Burbank Fire Department was on hand on Stage 16. When it detonated, the explosion sent a huge fireball up into the grid of the stage. “The fire department got a little excited, but we had enough fire people on hand that I wasn’t concerned about it. Tim had said he wanted it big!”

For the Penguin, the hour of retribution against Gotham arrives with a Patton-esque speech to his penguin army assembled in his icy lair. Live penguins — which were generally employed in wide shots — mingled on *The Island* with mechanical puppets and penguin-suited actors, providing a layering of different penguin types and sizes to represent the assemblage. While the live birds moved of their own free will, the penguin puppets were placed strategically for each particular shot. “We’d take foam dummy penguins,” Craig Caton recalled, “place them on the set using wooden dowels, and then get Tim Burton’s approval on their placement. Once he approved the setup, we’d take the dummies out and drill holes, mount the puppets, and stick all the cables and cable controllers underneath the set. The first day it took four to five hours to place all thirty puppets. By the third day we got it down to an hour and ten minutes.” In some cases, the puppets were placed specifically to create the illusion of a greater penguin population than actually existed. “If there was a dialogue shot with DeVito head on, we’d dress all thirty of our puppets behind him. Then, when they’d turn around to shoot Danny’s POV, we’d take all the puppets and dress them in front of him — so you’d get the impression you were seeing sixty puppets even though there were only thirty.”



Thousands of bats swarm out of the plaza Christmas tree and proceed to attack townspeople gathered to witness the tree lighting ceremony. Andy Kopra of Video Image computer generated the bat swarms, employing a behavioral animation system to program the flocking maneuvers. Once the basic flight patterns were determined, the bats were more fully rendered and composited into the live-action plates with convincing motion blur.



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Although the majority of the shots would require the puppeteers to be positioned underneath *The Island* stage, there were some nine isolated shots at the edges of *The Island* where the animators had to be on the surface. Deviating from the traditional black suits and hoods usually worn by puppeteers, the penguin operators had to wear white in order to blend into the ice and snowdrift look of Arctic World. The surface puppeteers, and the cables connecting them to their puppets, were further hidden using bushes and other camouflage. “Most of the puppeteering involved paying attention to Danny DeVito, operating the puppet necks to follow his eye-line and reacting to things,” Caton explained. “We operated them through fifteen-foot-long cable controls.”

For shots operated from underneath *The Island*, holes were drilled in the set floor and cables run through to the puppeteers below. The logistics of working underneath the Arctic World island, in a space that was only four feet high, presented daunting challenges to the Winston puppeteering corps. “We usually had forty — sometimes as many as fifty — puppeteers at any one time underneath *The Island*,” said Caton, “so there was a lot of cramping and crawling underneath. There was three feet of water around *The Island* and it leaked like a sieve even though pumps were going twenty-four hours a day to keep the water out. It was really a logistical problem, just fighting the water with all of our electronic components and cable controllers.”

“One of the big problems was when we had several puppets all clustered together in one area,” Richard Landon observed. “The cables went down through the holes in the set and then we had to spread out. But the fifteen-foot length of cable was not a variable length — we had a fifteen-foot umbilical and that was it. So everyone had to be in that fifteen-foot radius. We stacked people on top of each other as best as we could. It was elbow to elbow under the set — especially when we had more than a couple of puppets working.”

Puppeteers were also required to animate the servo-actuated faces and wings of the larger penguins, with the actors inside the suits providing the basic body movements. Performing in the suits was no lark. “The little people went through a lot,” Schoneberg noted. “They had no use of their arms because their arms were down at their sides in the suit — although there were handles they could hold onto to relieve some of the weight on their shoulders. We had a couple instances — fortunately not at all dangerous — where one of the little people fell over in a costume. For them, I’m sure it was horrifying because they couldn’t break their falls — they were like big bowling pins.”

The elder penguin suit construction, with an entrance point at the top where the headpiece could be pulled back, required the crew to literally lift the actors into costume. “We tried to come up with some classy way of getting them in and decided that the best way to do it was just to pick ‘em up and stick them in the suits,” Schoneberg explained. “Most of the actors were only fifty or sixty pounds, so it wasn’t a gigantic chore. The fabric opened on a velcro closure in the back of the suit along the lines of the shoulder blades. We’d peel that up and then the whole head and neck section of the suit would swing forward, allowing access to the inside. With the penguin head flipped forward and the little person inside the suit, it was a lot like somebody wearing a barrel. Shoulder

straps and other things were also in the suit to make it as comfortable as possible. The suits did have plenty of air in them because the fabric was pretty porous, with vent holes through the vacuform shell that allowed ventilation. We'd wait until the production was done rehearsing or lighting and then we'd dress them up for camera. We'd put the heads over the little people, close the velcro seal on the fabric in back, and do a final brush-down of the fur. The camera would roll for forty-five minutes maximum and then we'd take them out for a breather."

With most of the Arctic World scenes populated by three different species of live penguins, little people in suits and puppets all blended together, it became difficult to distinguish the real birds from puppets. "There was one shot," Schoneberg recalled, "where Tim was watching the monitor and he kept pointing out this one penguin, saying: 'Cut! Cut! Cut! That penguin's not moving!' He thought it was a puppet. So we tracked it down and it turned out to be a real penguin. I said, 'Tim, there's nothing we can do about that one!' A lot of times when we were watching dailies, we'd see Danny and a penguin interacting and we'd ask ourselves: 'Is that penguin one of ours or is that real?'"

The scene of the Penguin making his rousing speech would include a Busby Berkeley-inspired shot of the penguins diving into the frigid waters of Arctic World. The effect, originally conceived as a live penguin stunt, turned into a basic logistical nightmare. "The day had arrived when the Penguin is speaking to this stadium full of penguins, urging them on to attack Gotham City — and the penguins wouldn't dive into the water," John Bruno revealed. "Everybody had assumed that the penguins would just dive into the water from this two-and-a-half-foot platform. They had the shot all staged up and ready to go and the penguins wouldn't dive. We were then told by the penguin wrangler that penguins won't dive from a height of more than six inches. So Tim asked if we could make CG penguins dive into the water. It was Friday, so we had the weekend to figure it out. Working with Chuck Gaspar's effects team, we placed air mortars in the water and set them off in succession to simulate a Busby Berkeley water dive, and placed Stan Winston's puppets in the foreground. When that background plate was approved, Mauro Maressa did an animated pencil test which was subsequently used as a guide by Andy White when animating the CG penguins." To enhance the suggestion of penguins swimming beneath the surface, churning effects were later animated by Available Light and composited into another shot looking down on the water.

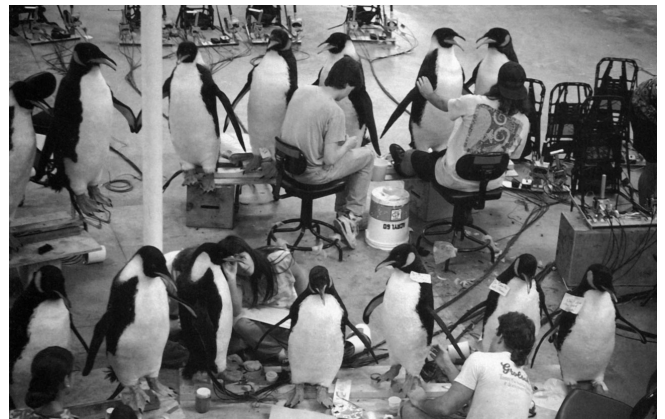
Although the live penguins shamed the memory of Busby Berkeley, the waddling birds were up to the task of carrying their strapped-on missile payloads for the march on Gotham Plaza — which was fortunate, since the Stage 16 Gotham Plaza set had not been rigged to facilitate the Winston puppets. The puppets were utilized, however, and shot elsewhere as a separate element composited into wide shots of the march on Gotham Plaza. "There was not a cost-effective way to do puppets on Stage 16," Schoneberg said. "They would have had to basically demolish the set to provide us with puppeteering slots in the floor. They decided it would be easier for them to use the real penguins in the middleground, computer graphics penguins in the background, and have a foreground element of the puppets."

When the penguins arrive at Gotham Plaza, ready to fire the deadly missiles strapped to their backs, *Batman* jams their command frequency, causing the birds to turn around and head back to the zoo. Like the march on Gotham Plaza, the turnaround shot required help from the Boss computer graphics department. "There was a high-angle CG shot of the penguins entering the plaza," said

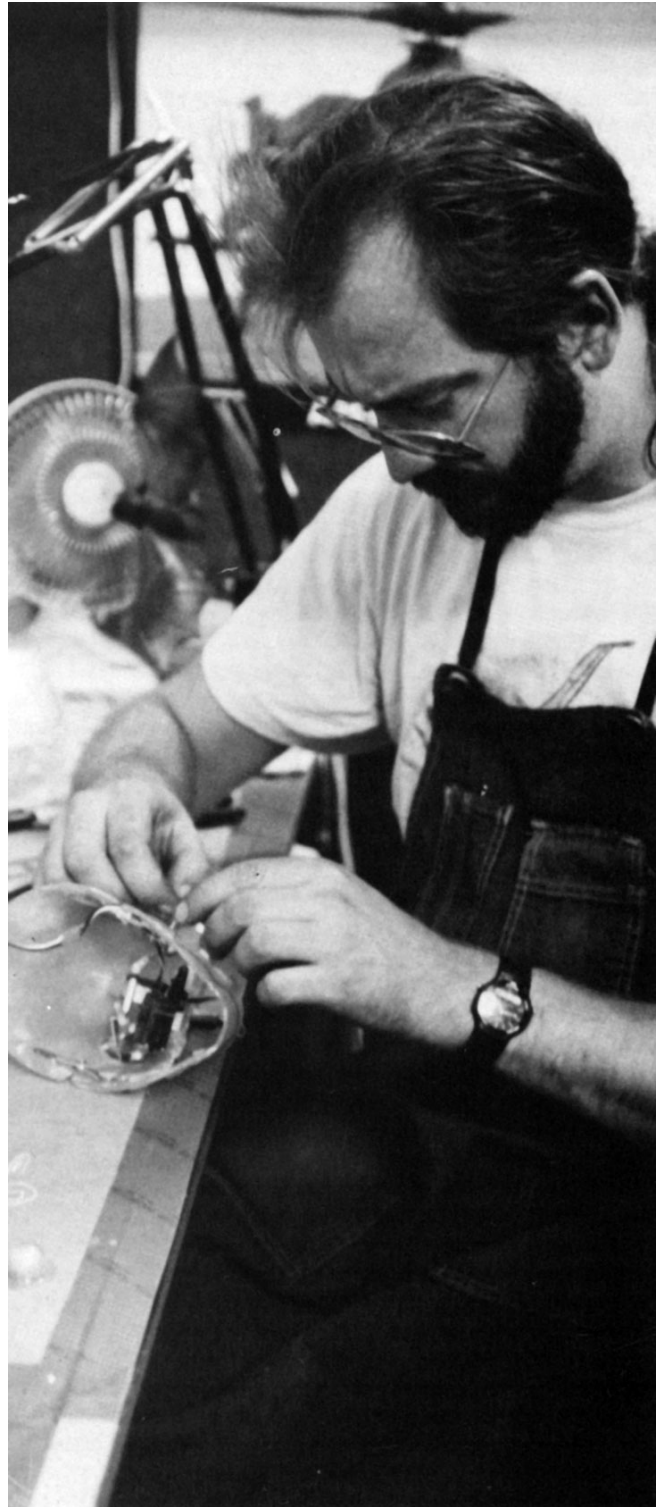
Fink, “looking down from the Shreck building. We were about to complete the shot when it was decided to expand this five-second high-angle shot to three shots. This was in March — which is pretty late in the day when you’re doing computer graphics. So the CG requirement went from five seconds of rendering to about fourteen seconds, with the penguins not only walking in and coming to a stop, but turning around one hundred eighty degrees and walking out when *Batman* jams the signal. Boss deserves a lot of credit for making a real rush and delivering the shots, without compromising quality.”



Exposed for the criminal that he is, the Penguin retreats to his subterranean lair where he rallies his penguin army for an all-out rocket assault on the citizens of Gotham. Augmenting some live penguins were thirty puppet penguins created by Stan Winston Studio.



Members of the Winston team administer finishing touches to the puppets. Vacuformed bodies and fiberglass underskulls were covered with dyed fur cloth, while colored markers were used to create subtle gradations for the penguin markings.



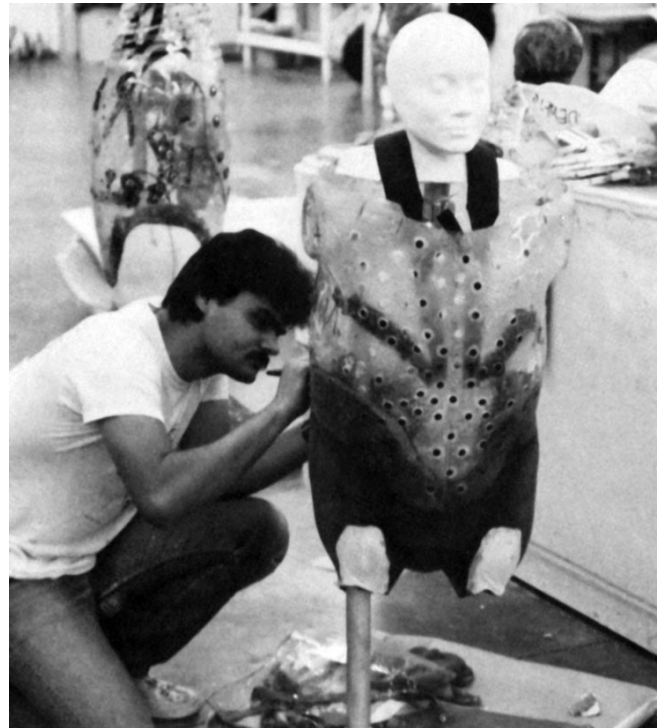
Mechanical department coordinator Craig Caton assembles one of the puppet heads. Nearly two hundred mechanical parts were required for each of the animatronic figures.

In an ironic twist — for the Penguin, at least — the witless, waddling army releases its payload in the direction of the old zoo. Because of the danger inherent in the rocket launches, neither live penguins nor live puppeteers were in the vicinity of the pyrotechnic display. The establishing shots of the penguins firing off missiles required the puppets to be mounted in place, with Gaspar's crew rigging monofilament lines behind all thirty puppets armed with two missiles apiece. The sixty rockets were released in waves of twenty and launched to the soundstage roof twenty to thirty feet above — even though the missiles were out of frame at approximately fifteen feet. “For the rocket launch scenes,” Caton explained, “we fastened stands into the snow and then we attached the penguins to the stands. The puppeteers were connected to the puppets with their cable controllers and remote control and they were dressed into snow banks and gulleys. All the rockets were on guide wires that reached up into the ceiling of the stage. One problem that arose was that they were firing two salvos of rockets per take and the first salvo of rockets would be spent and falling back along the wires as the second wave was going by. So we had people stationed up on catwalks to catch and hold the rockets as they came up. The rockets themselves weren't hot so the crew could just hold them with their bare hands.”

Shots of the missiles exploding would be photographed at The Chandler Group's shooting stage utilizing the old zoo miniature. Because of the fire danger, Stetson Visual Services had fashioned the zoo grounds from a special fire-retardant urethane spray foam manufactured by Foam-Tec. “Regular foam burns,” said Stetson co-owner Robert Spurlock, “and when it burns, it puts out cyanide gas. Foam-Tec's owner, John Blom, represents his product as the only fire-rated foam in the industry. The stuff will not sustain a flame. The old zoo grounds were constructed mainly from chicken wire



Crew member Kenji Kurata works on one of the partially completed puppets.



Larger penguins — with radio control capabilities — were constructed as suits that could be worn by little people. Jeff Periera drills ventilation holes into one of the rigid torsos.

covered with paper that they then over-sprayed with this foam, a couple of inches thick so that it had some strength to it.”

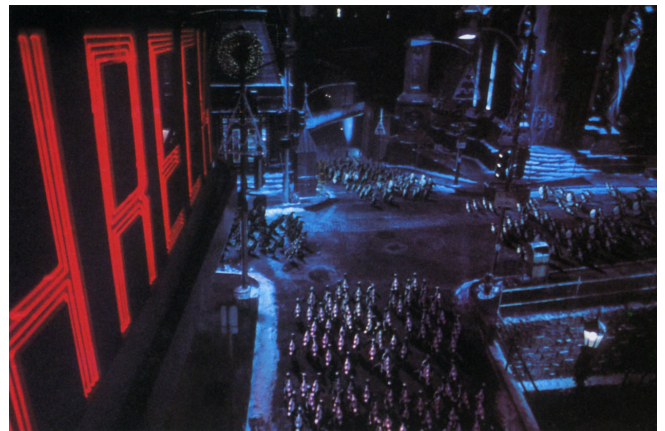
Before model construction for the sequence had begun, Stetson and Don Baker of The Chandler Group had engaged in several in-depth discussions with Mike Fink regarding the look and dynamics of the explosions. Thaine Morris was also brought in to consult in the development of the pyrotechnics. For a test on a stage in Glendale, Stetson Visual chief modelmaker Ian Hunter and crew built a set. The Chandler Group shot the tests, while Robert Spurlock and Thaine Morris did the pyro rigging and operation. “After Mike Fink reviewed the resulting test footage with Tim Burton, he came back with Tim’s ultimate compliment to a miniatures crew: ‘What location did you use to shoot this?’ That early test demonstrated that the miniature effects could be achieved as complete, in-camera photography. The rocket smoke trails, the smoke and flame of the explosions, the spray of snow and debris from the air mortars were comprehensive enough visually so that optical enhancement would not be required. Also, the camera speed and light output of the pyro were within the range of the capabilities for ambient stage lighting. This was a big bonus because it increased Chandler’s ability to provide multiple camera angles and additional coverage.”

When it became evident that Thaine Morris would be unavailable for the actual effects shoot, Spurlock brought in Joseph Viskocil to assist in a second test and, subsequently, to effect the miniature explosions. “Thaine was able to show Joe the approach he was using for the explosions,” Spurlock recalled. “Joe brought a lot of experience and know-how to the job, so we knew he could quickly match stride with our work to date on the project, with no lost time. Together with effects specialists Roy Goode and Gary King, and with support from Ian Hunter and miniatures specialists Jim McGeachy and Ron Gress, we rigged, dressed and operated the physical and pyrotechnic miniature effects over about a one-week shooting schedule.”

The pyro work required dozens of rockets to criss-cross the old zoo, exploding pavilions, including the Arctic World pavilion where *Batman* and Penguin would meet for their final battle in the lair below. “The whole trick to miniature pyrotechnics is to make the small look big,” Viskocil explained. “A lot of it has to do with camera speeds and lenses, how fast you’re shooting it, and what the object you’re blasting is made of. My major concern with this film was that since we had a deep set that would be exploding all over the place, the stuff in the



The Penguin addresses his troops — computer generated penguins created by Boss Film using the same flocking program employed by Video Image for the computer generated bats.



One of the major sequences utilizing digital penguins was the march on Gotham Plaza. Once the basic walk cycle and body movements were orchestrated, a wire-frame

foreground had to be larger than the background to give it scale.”

To represent the penguin missiles, the pyro team employed Estes model rocket engines. “When I was a kid I used to send these rockets up into space,”

Viskocil related. “They’re small — only about an inch-and-a-half long by a half-inch — but they have a lot of power and a scaled smoke to them.” The

Estes rockets had been modified by Spurlock and Morris to improve their performance. “We bored out the chokes on all of them to slow their velocity and increase their smoke and flame rate,” noted Spurlock. “We also tried adding little fins for directional control, but found that with the wire guidance they weren’t needed. We painted them all to match the penguin rockets seen in the film, just in case one was visible in frame.”

By attaching each rocket to its own guide wire, Spurlock, Viskocil and three other technicians could string the line to the trip switch and explosive charge at its designated point. The wire was not only strong enough for the job, but invisible on film. “The wires worked out perfectly,” Viskocil recalled, “but there were a few times when one of the rockets would start off and burn through the wire and break off.” These little rockets have an engine in the back that creates a fire when initially ignited, so there’s a second where the blast can singe the wire. The trick was to prevent that; so we put aluminum foil baffles right up against the rocket’s initial starting point to prevent it from burning through. Once the rocket was on its way, it didn’t have time to burn the wire.”

Storyboards for the sequence called for the pavilions of the old zoo panorama to be “laid to waste in a symphony of fireballs.” To accommodate the action, some of the riggings had as many as thirty separate rockets going off in one shot, in pathways determined by Spurlock and company with direction from Mike Fink. “We had rockets going from top of frame, bottom, underneath the camera, all hitting the pavilions at different angles,” said Viskocil. “Since the camera was shooting at around one hundred twenty frames per second we couldn’t release all those rockets by eye. The ignition was patched into a timing sequencer device so we could choreograph the rockets. The real trick to this whole thing was repeatability. Once we knew when something was going to go off, we could repeat it as many times as we wanted at exactly the same time. We had everything timed down to a thousandth-of-a-second on some of them. We ran wires from the board to squibs — little match heads that created the spark that, in turn, ignited the rockets.” Once the rockets were blasting along the wires to their targets, a foolproof rigging was devised by Spurlock to halt the speeding missiles. “These rockets had something like a ten-second burn, so when they reached their targets they would still be burning. We caught the rockets in some cylinders underneath the model. The cylinders had an iris effect with the trip switch in front; so once the rocket tripped the switch, the rocket would go into the cylinder and stop right there — it couldn’t possibly come out.”

The explosive charges ran the gamut from black powder and gasoline to primer cord and bullet hits. In some cases, the model pavilions required additional rigging for the full collapse following the initial explosion. “Some of the pavilions were actually pulled down faster than gravity would, by means of a cable system rigged under the table,” Spurlock said. “The cables went to bungees connected to the pyro trips. For example, the Arachnosphere had a rocket come in and hit near one

penguin was modeled in the computer, then wrapped with texture and color to create a fully rendered figure. While live or puppet penguins were used for closer shots, long shots of the entire penguin army were achieved by the Boss digital team. Converging on Gotham Plaza to unleash their weaponry, the penguins suddenly reverse direction and turn back toward Arctic World when Batman jams their commander-in-chief’s control frequency.

of the pavilion's legs that were spindly and rusted and disintegrating. The rocket tripped the switch that set off the explosion which released a tightly bound bungee cord that pulled some cables at the same moment, bringing the model down faster than it could have fallen on its own. Since we were filming at one hundred twenty frames per second it looked like it was just falling at normal speed. A lot of times when you shoot things at overspeed, especially with miniatures, you have to make them act faster than they normally would because you're trying to get a sense of scaling and if you don't it takes too long for everything to happen. Our rocket hits happened in real time within a second and a half, but on screen it was seven and a half seconds." The spiderlike Arachnosphere was one of many pavilions rigged to sustain a pyro hit and be reassembled for another take. "One half of the Arachnosphere was steel framed with a plaster shell on the outside and the other half was soft aluminum frame with the same plaster shell," said crew chief Ian Hunter. "The cable and bungee system pulled it down onto the table on cue and that crushed the aluminum side but left the steel side intact. We could then pull it back up and get ready for take two by putting on a new set of plaster skins and aluminum that just had to be tightened down by screws."

With the penguins raining destruction from above, *Batman* descends into the underworld behind the controls of his batskiboat to meet the Penguin on his own turf. Part boat, part jet-ski, the craft was in the tradition of *Batman*'s one thousand one crimefighting inventions. To achieve the sequence, 4-Ward went to work on another carefully orchestrated series of miniature shots using a batboat model and staging the action in the tunnel they would later find themselves using for the expanded baby carriage shots that comprised the title sequence.

Unlike the title sequence, which required more detailing of the tunnel for the closeup shots that followed the floating carriage's meandering course, the batskiboat tunnel shots would be focusing on the action of the speeding craft. "The boat was a quarter-scale miniature driven on an underwater track," said Bob Skotak. "It was pulled along on a chain-link mechanism, engineered by Lee Stone and Steve Brien, that was actuated by an air motor — a turbine-like motor driven by air pressure. The advantage of air motors is their ability to start and stop very quickly. One of the things we needed to do was absolutely maximize the travel distance by minimizing our start-up and stopping zones. The speed that Tim wanted for the batskiboat was around seventy miles per hour in real life, which meant our model needed to travel at thirty-five miles per hour, at forty-eight frames per second in scale. So, even with a hundred twenty foot tunnel, that thing would just tear through and the shot would be over."

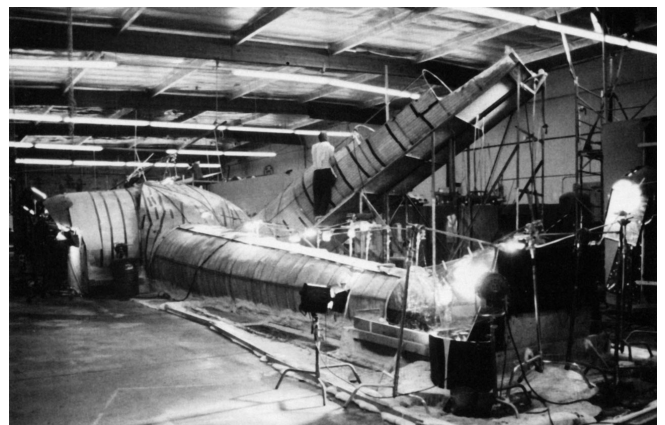
With the model weighing nearly eighty pounds and reaching five feet in length, it was a formidable object to be propelled, particularly when hurtling straight at the camera. "We had an opening long shot of the boat coming past us, going left to right, that was all in-camera, photographed with a fourteen millimeter lens," Skotak recalled. "This meant getting in extremely close to the boat. Our cameraman, Jim Belkin, had to pull back, pan and get out of the way in a fraction of a second to avoid getting hit. He did an amazing job." The parallel tracks required exacting construction for the paths the batskiboat would travel in specific shots. "Because of the speeds involved, the track had to be built and leveled with a laser beam and maintained very carefully throughout the whole shoot."

As with the carriage sequence, the tunnel could be accessed in a variety of ways, depending on the specific angle of the shot. For the shot of the craft zooming past from left to right, the crew had only to cut into the side of the tunnel, film the boat, and then patch the tunnel up for the next shot or

reconfiguration required. The biggest challenge in the entire sequence involved a track configuration the crew dubbed the 'corkscrew.' In the shot, two blackfoot penguins suddenly rise up from the murky waters to launch missiles at the on-coming batskiboat. Just before impact, *Batman* employs the craft's jet-ski capabilities to swerve up the curved side of the tunnel and back down, avoiding the explosion. Two cable-operated penguins — with missiles strapped to their backs, launched via remote control — were custom-made by Jim Towler for the shots. For the craft's evasive maneuver, the two sets of track had to be built up into the wall of the tunnel and laid perfectly parallel to each other. Like a rollercoaster ride, the corkscrew configuration of the tracks would have to handle the high-speed, gravity-challenging move of the heavy miniature. "If any of the wheels were impeded or slowed at that speed, it would have just ripped the whole track apart," Skotak noted. "There was a need for perfection and precision in those tracks. It was tricky since they had to follow the contours of the tunnel, which meant a wide-wheel-based craft had to negotiate a circular path, then make an abrupt transition to the flat surface of the tunnel bottom."



Braced for a final confrontation with the Penguin, Batman powers up his batskiboat for a highspeed run through the sewer tunnels leading to the Arctic World lair. The sequence, which required an extensive tunnel miniature, was realized by 4-Ward Productions. 4-Ward director of photography Jim Belkin mans his plastic-wrapped camera while effects supervisor Robert Skotak lays last-minute dressing into the quarter-scale set.

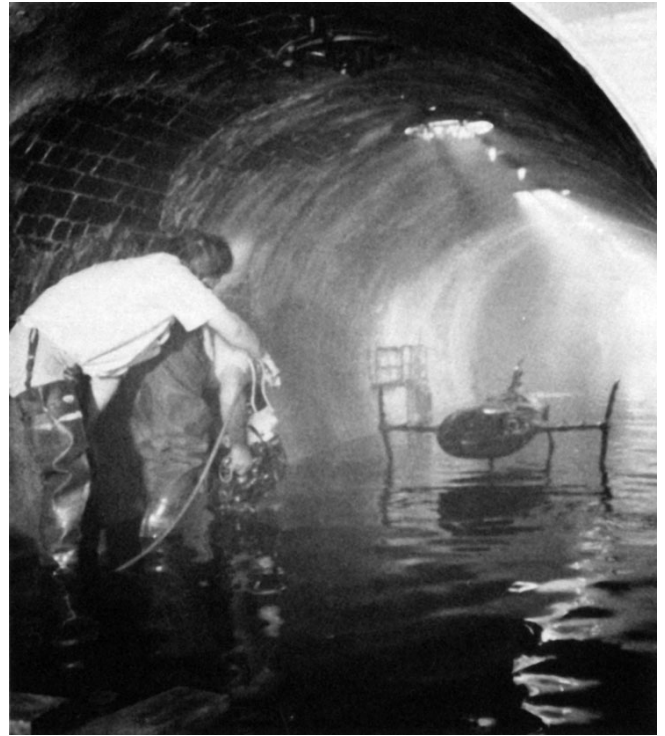


The sewer tunnel exterior. Underwater track was laid into the set as a means of directing the batskiboat. One section of the one-hundred-twenty-foot tunnel was angled upward to effect a shot of the batskiboat bursting through the Arctic World facade.

To put the corkscrew challenge in perspective, an outside contractor specializing in aerospace work had failed to come up with a workable track. “The company that was supposed to deliver this to us didn’t make it in the delivery time they had promised,” Skotak noted. “They really couldn’t make it work. They must have thought, ‘Oh, so it gets delayed a month or two.’ Well, maybe that’s the status quo for the aerospace industry; but in a motion picture schedule a day can be fatal. So our crew had to solve a lot of problems that weren’t initially on our plate. Joel Steiner, Steve Brien, Lee Stone, Bruce Hayes and Ricc Ruskuski were all involved in piecing together this double-helix corkscrew effect. This entailed a lot of weight being pulled very fast with a wide range of changing fields of stress along the track, the weight of the boat shifting dynamically as it was going up the wall. The crew had to design the track and wheel mechanism so as pressure was being transferred from the upper wheels to the lower ones, the shift in distribution wouldn’t tear the model loose — and that was a major problem.”

The 4-Ward team faced the additional problem of having to remove or conceal the corkscrew track itself. The crew initially considered digitally or optically removing the tracks, but Bob Skotak devised an in-camera method. “I came up with the idea of just taking tissue paper and painting it black, putting spray adhesive on it, and dressing it over the track. Then we put razor blades on the leading edge of the wheels. As the boat passed, the blades would make thin slices through the tissue paper creating very fine slits that would not photograph on film.”

The entire sequence required a myriad of details and subtle effects to be readied before filming. The batskiboat was given a scaled rocket engine look with a flame ribbon in the model that would be lit by the crew before each take, while a nine-volt battery powered a small fan inside the model to push the flame out. Other effects that had to be prepared moments before the cameras could roll included actually ‘dressing’ the sewer water and introducing a ghostlike mist into the tunnel. “Every shot would have these transient water and smoke effects going which would take forever to get just right,” Skotak explained. “Then it would be: ‘Let’s shoot it!’ And we’d have to ignite the flame on the boat and hope we hadn’t lost these delicate atmospheric effects in the interim. One of the challenges came in getting a specific look to the water and the atmosphere in the tunnel. When you’re shooting water, it can look very miniature-ish. You usually have to break it up with a lot of air movement to create waves and ripples. In this case, however, the water was stagnant; so in order to create a sense of scale, we used a lacquer spray paint and sprayed it over the water from one end of the tunnel to the other to create a mottled, disgusting surface scum. We’d carefully spray this detail



The five-foot-long model was propelled by air pressure at speeds up to thirty-five miles per hour. Skotak directs an air stream toward the model to create scale-enhancing waves on the water surface.

onto the water's surface, back out of the set, and hope everything would stay in place long enough for us to get behind the camera. Then we'd add fog through four location points where we had holes poked in the tunnel. The fog would come into the tunnel billowy, but because the water at the bottom was cold and the lighting units heated the upper part of the tunnel, we had created a natural inversion layer that allowed the fog to settle out in cloudlike, stratified patterns along the entire length of the tunnel. It was extremely effective."

The sequence was completed largely in-camera because the number of interactive elements seemed to naturally dictate that approach. "We had initially thought about shooting the missiles bluescreen, but there was a question of how well it would matte in. There were also many interactive elements, such as the reflection of the fire in the water, the slight ripple of water as the missiles launched, smoke and the perspective of smoke, that we found ourselves doing it all in-camera. The production schedule was also pretty tight; so by doing it that way, the director could see the finished shot without having to guess what it would ultimately look like."

At the end of the sequence, the batskiboat flies through the roof of the Arctic World pavilion. "The original storyboard for the batskiboat bursting out of Arctic World illustrated a wide-angle shot looking up at the boat," Fink recalled. "I asked the Skotaks to put a second camera on that to give us another, tighter angle. Ultimately, both angles wound up in the film and that really helped the sequence. By adding the second camera, changing the position of the first camera and altering the way the support arm dropped the boat, the batskiboat came closer to the camera lens, more overhead." The batskiboat model was mounted on an armature pylon — at an angle hidden from camera — and thrust through a breakaway plaster miniature of the Arctic World facade. "The facade was made of sections that were broken up and pre-cut and pieced back together with balsa wood backing and detailing on the backside, then spackled over," Bob Skotak explained. "We rammed through it while filming with our two cameras that were overcranked at sixty to seventy frames per second."

In the final, deadly encounter, the Penguin releases bats to attack *Batman* — but the screeching creatures turn on the birdman instead, forcing the terrified Penguin to crash through a skylight into the waters of Arctic World below. For the bat attack, Danny DeVito had to act in response to invisible attackers, with Video Image animator Andy Kopra designing his CG bats to interact with the live-action plates. "Getting the bats to attack people was challenging," said Kopra, "because I had to make something that essentially had its own behavior work with an actor's reactions. I wasn't really controlling the individual bats; I was tuning their simulation values until their behavior seemed to match the way the actor was behaving. Initially, the bats were rather mosquito-like, and didn't move very fast. We struggled with their size, as well as their speed. The size of the bats was finally exaggerated, which made them seem more threatening and look as if they were really attacking the Penguin."

Staggering from the bat attack, the Penguin falls through the skylight just as the lair begins to rock with the concussive effects of the rain of missiles. A Penguin-suited stuntman was called upon to crash through breakaway glass and freefall forty feet to the watery set below. With solid set pieces close at hand, and the water a relatively shallow fourteen feet, the stunt was a nerve-wracking one for those involved. “The skylight was steel,” Chuck Gaspar noted, “and one portion of it had real tempered glass, along with a section done in sheet lead and breakaway glass for the stuntman to fall through. It was a really small area that he had to hit. It was also tricky because he couldn’t see his target once the glass was installed. He had to calculate his jump before we put in the breakaway glass. We ran several tests, put the glass in, and did the jump. It was a little spooky, but there were no problems.”

The special effects crew also had to orchestrate the fiery destruction of the lair as the errant missiles impact upon it. A structure was built high above the set — out of camera range — from which to deploy flaming debris. “We had a double-decker house up there, all fireproofed,” Gaspar explained. “We’d light debris on fire, and guys in fire suits would just shovel it down a big chute through the skylight. The fire department wouldn’t allow us to use propane; so we had to go to methane gas, which is hard to find in pressurized form. We took that methane gas up to the grid and had a winch and fire bars set up. The bottom part of the double-decker had windows down at the level of the skylight, so the camera angle looking up would see the fire flicker through the windows.”

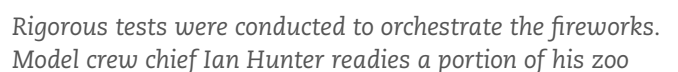
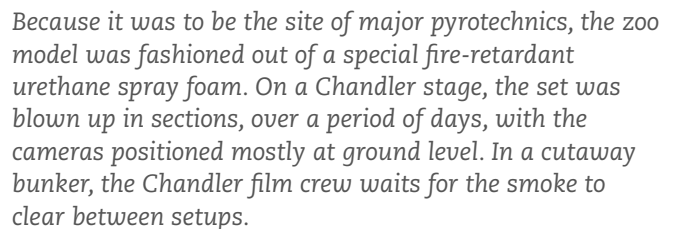
The blazing Arctic World is also the scene of the final face-off between Max Shreck and the Catwoman. As the mad mogul fires his gun into her, the Catwoman keeps advancing until she lashes out with her steel talons, ripping into an open fusebox that explodes the lair generator in a burst of smoke and electricity. With the Penguin dead in the water, Max Shreck a charred corpse and the Catwoman missing, Batman



As Batman jets through the sewer tunnels, two penguin warriors suddenly rise from the murky waters and launch missiles toward the speeding batskiboat. At the last moment Batman avoids the rocket impact by swerving up the side of the tunnel in a corkscrew trajectory. 4-Ward produced two cable-operated penguin puppets for the shot, equipped with small rockets launched by remote control.



Just as in the first film, *Batman Returns* would end with a signature crane-up through the vertical levels of Gotham City to reveal the bat signal triumphantly emblazoned on a cloud. To create the shot, Matte World crafted a multiplane miniature setup that was filmed horizontally along a forty-foot motion control track. The final crane-up would be a complex layering of live-action, model buildings and painting elements. “We started the visualization process by doing a smaller version on video with the different planes cut out of foamcore,” Craig Barron described. “The test allowed us to show Tim Burton the shifting perspective and overall distance traveled. We then just scaled that up, multiplied by the factor needed to keep all the different planes in focus.”

[illegible]

shift between the three-dimensional foreground and the two-dimensional midground.”

model for a miniature explosion. Rockets mounted on invisible guide wires triggered the pyrotechnic charges.

“There wouldn’t have been any change in perspective if we had just projected the live-action plate onto a matte painting and craned up a painting that was obviously a two-dimensional piece of artwork,” Barron added. “So what we were doing was fooling the eye by adding miniature pieces in front and behind the painting plane to give you the visual cues that you’re actually moving through this big cityscape.”

Matte World’s in-camera effects placed particular demands on the motion control camera operatives. “One of the things that our camera assistant Rich McKay had to do that was unusually demanding,” said Barron, “was to keep track of all the latent image film we used for our multiple camera exposures to maintain the shots on the original negative for first generation quality. By working on the original negative, our shots would cut very cleanly with the production footage. For shots that had to be duped, such as the matte shot of the bat signal turning on with Bruce Wayne sitting in his mansion, we shot Vistavision plates, keeping it on a larger format to help us with the quality of the grain structure.”

The crane-up was originally slated as the final shot of the film, until preview audiences who saw an early cut expressed concerns about the fate of the *Catwoman*. Although a suggestive shot of the *Catwoman*’s shadow catching *Batman*’s attention as he drives away from Gotham had been included, the original ending had left it ambiguous as to whether Selina Kyle had survived the electrical explosion in the Penguin’s lair. In the last week of May, the production decided to devise a new closing shot with the *Catwoman* gazing up at the bat signal. I thought the shadow of the *Catwoman* that Bruce sees as they’re driving past the alley was fine,” noted Mike Fink, “and so did everybody who made the movie — including Tim. But they kept getting cards back from the test screenings asking about whether *Catwoman* had survived or not. Apparently, the shadow wasn’t clear enough. Well, it was May 22. We had finished the show, and I got a call from Larry Franco, the producer, telling me not to pack up. Tim, Larry and I spent Memorial Day weekend trying to nail down what we were going to do. We ended up shooting a double of *Catwoman* in front of a bluescreen. Then we composited that bluescreen element into the foreground of the original Matte World crane-up shot.”

Batman Returns was full of such herculean efforts. Despite the potential pitfalls and nightmares, the final result was a seamless vision. “I feel very good about the work of all the effects houses,” Tim Burton stated. “I look at their shots and there’s real thought and artistry involved, which I love. Often I look at effects shots and there’s a coldness or a sameness to them. But on this movie, the effects houses went the extra mile to really capture the feeling of what we were trying to create. Maybe it’s because Mike Fink did a good job of keeping it together, but there’s been a consistency that’s the best I’ve ever experienced.” Burton’s triumphant return to Gotham was aided by his ability to avoid being sucked into the media and merchandising maelstrom of Bat Biz. “Part of my problem on the first movie was that thrusting me into a big-budget, action world was a little bit like putting oil with water. I think what I learned is that it’s best just to make a movie and not get caught up in the scale of it. I tried not to get swept up in what happened before, but instead just treat it like it was a completely new movie. The only problem was that we had an extremely accelerated schedule. I showed the studio the movie four weeks after we stopped shooting, which is unheard of for me.”

For Michael Fink, the key to the film's seamless final look was Burton's ability to work well with his effects talent. "I've worked on shows that were absolute nightmares," observed Fink. "This one could have been like that very easily, but wasn't; and I think it was because of Tim. His nature is to make the shots work. He's the only director I've ever worked with who looks at visual effects shots the same way he looks at his dailies. It's always been a contention of mine that some directors get into postproduction and they'll keep trying to improve an effects shot instead of just looking at it as part of the entire motion picture. With Tim, that's just not an issue. That made it possible for me to keep a global view of the entire film and not get lost in the minutiae."

Even as Burton was deep into postproduction and the effects houses were helping to bring the effects-intensive production to life, the business forces behind the *Batman* phenomenon were gearing up for a second run at the Zeitgeist. At Boss, even as the *Batman* flying puppet was being encased in glass and presented as a gift to producer Larry Franco, effects artists were creating a winged batsuitcase to fly through the Gotham Plaza miniatures for a Choice Hotels International television campaign. At the Warner Brothers lot, a heroic statue face from old Gotham silently looked on as the inner city rooftop set, which included Selina Kyle's apartment, was being dismantled. Meanwhile, around the corner at Stage 16, Gotham Plaza was still standing, but a plaza shop had been redressed as a Gotham McDonald's for another promotional tie-in campaign. Weeks before the film's release, bus stop signs and billboards glistening with the dark shapes of *Batman*, *Penguin* and *Catwoman* were heralding the *Dark Knight's* return, while the back covers of DC comics had glossy ads showing the sleek-slicked bat emblem. And as the June release week dawned with its premieres and press previews, visions of record boxoffice grosses danced in the executive heads at Warner Brothers.

But the publicity and merchandising machines that had tried to stoke interest in even such well-crafted comics adaptations as *Dick Tracy* and *The Rocketeer* had failed to grip the public imagination. Other movies based on such classic comics characters as Captain America were either being shelved or given a one-way ticket to video release land. *Batman*, however, has not only outlasted the countless other superheroic characters that sprang to life back in the so-called Golden Age of Comics a half century ago, but has periodically rocked the pop culture landscape with volcanic force. The strange tale of the haunted crime-fighter has held an undeniable and lasting popular appeal. "For whatever reason," Burton mused, "Batman taps into something that has not been fully verbalized, explored or intellectualized. It taps into the subconscious the same way that fairy tales or myths do. And that's the attraction, I think."

Batman Returns photographs courtesy of Warner Brothers. TMs and © 1992 DC Comics, Inc. All rights reserved. Production unit still photography by Zade Rosenthal, Dean Williams and Jane O'Neal. Special art by Jack Pedota. Boss Film Studios still photography by Virgil Mirano. The Chandler Group still photography by John Scheele. Additional photographs and frameclips courtesy of Stan Winston Studio, 4-Ward Productions, Video Image Associates and Matte World. Special thanks to Jeff Walker, Michael Singer, Claire Wilson, Tara Croccito, Holly Borradaile and Jess Garcia.

COMMERCIAL SPOT: DODGE BLOCKS

article by Christine Sellin

Eight years ago, the BBDO agency created a Dodge trucks campaign centered around dropping a standard truck from twelve feet in the air to graphically illustrate the strength of the vehicle. Searching for a possible visual successor, BBDO Detroit writer Jerry Hunnicutt and art director Gary Slomka posed a different scenario.

What if massive granite blocks were to fall from the top of frame onto a plain white floor? On the face of each would be a photographic section of a Dodge truck, so that when enough blocks fell to form a wall the image of the truck would be complete. Then, what if a person standing in front of this wall were to get into that 2-D truck and drive it off?

Agency producer Jim Nicoll reviewed the idea with Praxis Film Works director Robert Blalack and executive producer Nancy Rushlow, leaving them to ponder how a series of four such spots might be made. “And by the way,” Nicoll added, “we don’t want any cuts. Each spot has to be a seamless thirty-second visual puzzle.”

Both the agency and Blalack rejected computer graphics as a viable approach, seeing real blocks as optimal to imparting the concept of massive stone blocks falling. So a team of modelmakers was assembled by David Kelsey to sculpt the four-by-four-foot blocks from dense styrofoam. Each block was rigged with invisible guide wires to insure precise flight and landing. The bounce could be ‘tuned’ individually by the addition or subtraction of lead shot. Three overhead gantries were built to allow for laser leveling of the wire guidance system. “We had a near-zero tolerance,” Kelsey noted. “If any one of the blocks fell as little as an eighth-of-an-inch out of vertical, it would smash into an adjacent block, breaking the wires. We were fortunate that during shooting we had only one minor collision.” Rosco bluescreen paint was applied to the front surfaces so that a traveling matte with integral blur would be produced. Reference grids were placed onto key blocks to facilitate alignment, both on the stage and in postproduction. Baby powder was applied to amplify the effect of dust shedding from the blocks upon impact.

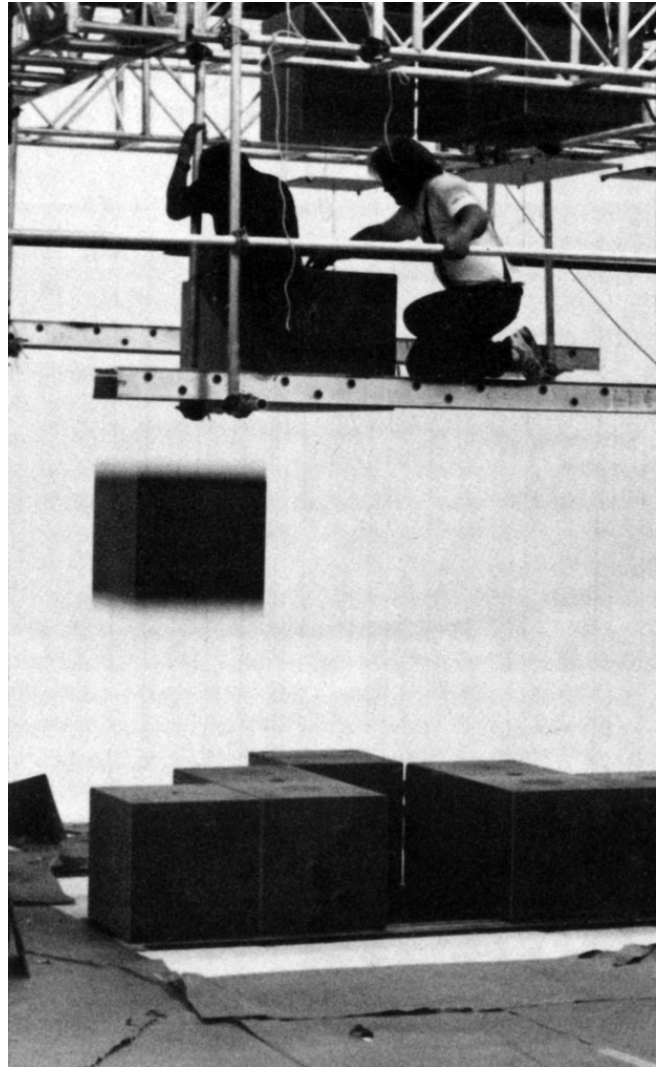
The block elements were shot on one of the Praxis stages, and the camera lens and perspective data were exchanged with the live-action unit, which was working on a second Praxis stage. In each spot, after the foam blocks formed a wall, the actor in front would interact directly with the segmented truck. In one, the blocks fell in a checkerboard pattern and then pivoted under motion control to form a wall. In another, some of the blocks fell with portions of a chassis tracked onto their front surfaces. An actor on set rotated the massive blocks, revealing the entire truck on the back side. In yet another, after the wall of blocks was built, three smaller blocks fell in front. On the face of these blocks was a photograph of a man who became three-dimensional and stepped off the blocks, climbed into the truck and drove away.

Because each spot called for the actor to appear to be outside the environment of the blocks, while simultaneously in front of the truck — as well as interacting with the truck as if it were a 2-D photo — Blalack had to devise a method to make it appear that the actor was not a part of the truck

environment. He did so by shooting the actor performing with the truck, but with small curved blue or green screens in place to allow his feet and body to be matted outside the edges of the blocks. Frequently the actor would have to move off of one of the small screens positioned directly in front of the truck and perform in front of the actual vehicle. Director of photography Robert Steadman designed his lighting carefully so that no shifts in exposure would occur when the matted actor moved into a nonmatted position. This was particularly challenging given the zero- to four-foot promixity of the process screens to the actor. Bill Feitner at Composite Image Systems came to the set and consulted with Praxis during the shooting of some particularly complex matted-to-live transitions.

Having shot the actor and the blocks for each spot, Blalack worked with editors Phil Gessert and Steve Moore to assemble the complex layering. Electronic compositing was employed, with the separate film elements pin-register-transferred to D1 videotape at CIS under the expert eye of Don Lee. Each block for each spot was tracked and the corresponding truck sections were composited onto the faces. Tracking and compositing for three of the spots was undertaken by Composite Image Systems, with the fourth being completed at Digital Magic.

“One false move, either on the stage or in post would have turned the entire effort into mush,” noted Blalack. “We were fortunate to work with superbly skilled and dedicated technicians and artists.” Having won several prestigious broadcasting awards for the first series of spots, BBDO has returned to Praxis with another four. “These spots will either make blockheads out of all of us or be even more magical than the first ones.”



Foam blocks faced with bluescreen material drop to the floor at Praxis Film Works during production of an innovative series of Dodge truck commercials.

VIDEO BEAT: SHORT INTRUDERS

article by John Shannon

Whether the insectlike monster of the *Alien* saga, the vaguely amphibian E.T. or the iridescent Anterians of *Cocoon*, extraterrestrials in the movies have typically originated in the minds of designers, writers or directors. Restrained only by the limits of their imaginations, filmmakers have been free to create alien entities of every possible configuration and temperament, unconcerned with accuracy or realism. Such was not the case, however, with *Intruders*, a recent CBS television movie directed by Dan Curtis, which featured extraterrestrials fashioned after the first-hand descriptions of people claiming to have been abducted by alien beings. To realize the prominently featured aliens, visual effects supervisor Mitch Suskin enlisted creature creator Robert Short, an Academy Award winner with whom he had worked previously on *Close Encounters of the Third Kind*, *E.T.* and *Cocoon*.

Intruders concerns a young woman (Mare Winningham) haunted by dreams — or are they memories? — of alien encounters. Through sessions with a hypnotherapist (Richard Crenna), the woman recounts her alien abductions in a series of horrific flashbacks. Interestingly, descriptions from real-life abductees that would form the basis of the film designs were garnered in a similar fashion. “I talked to abductees during the production meetings,” Short recalled, “and just before finalizing the designs, we had an abductee come in who was actually put under hypnosis. We asked her specific questions regarding what the aliens looked like, how they moved, et cetera; and we used all of that information to achieve as accurate a rendering as we could.”

Meticulous research notwithstanding, the creatures described in detail by the abductees were ultimately modified — a concession to the logistical and aesthetic realities of filmmaking. “We didn’t want to go too far afield of what the abductees had described, yet we had to stretch those parameters a bit,” Short acknowledged. “For instance, the abductees all seemed to indicate that the aliens moved very quickly and efficiently. But after some discussion it was decided that we’d be better off going with a slower, more dreamlike kind of quality. Originally, the film was going to be really scary; but then Dan Curtis decided to soften it and make it more friendly. And it was much more friendly to feature the aliens as typically languid, slow-motion creatures, rather than frantic, horrible presences.”

Having determined that a variety of mechanical puppets would best portray the aliens as described by the abductees, Short produced a number of one-third to one-half-scale clay maquettes representing the two distinct types featured in the script — the alien drone and the ‘doctor’ alien. The maquettes had been approved and the puppet bodies built when Curtis decided to alter the design. “The body was built exactly as described by the abductees; but Dan didn’t think it was muscled enough, so we had to go back and create a quick secondary sculpture. We made foam rubber appliance muscles that we then glued onto the puppet body.” The aliens’ haunting eyes also went through an *Evolutionary* process. “We originally recommended that the eyes be much smaller than what the abductees indicated. We have found that the smaller the eye on a creature, the more

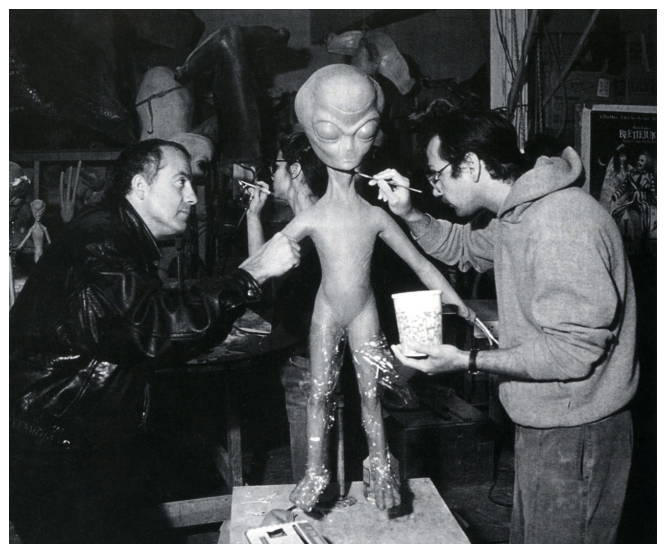
believable it becomes.” Curtis rejected Short’s suggestion; however, after seeing a finalized version of the alien on the set, he reconsidered and requested that eyelids be added to create a more convincing orb.

Once the designs were finally locked in, Short and his crew began constructing the cable and radio controlled puppets. “Mike Hosch sculpted the doctor alien and Doug Turner did the sculpture on the drone. We made a fiberglass mold of the doctor; but, unfortunately, it was during the heavy rains in Los Angeles and the moisture destroyed the mold — which also ruined the sculpture. So Doug had to resculpt the doctor at the last minute. We switched over to a more ‘moisture friendly’ material for the drone, going with a stone mold. All of the molds were made by Rich Slifka.” After the molds were completed, Andy Workman and Bob McGee went to work designing and assembling the cable and radio control mechanisms.



For The Intruders, a TV movie about alien abductions, Robert Short Productions was enlisted to supply an array of extraterrestrials.

Altogether, seven puppets were built — five full-figure versions capable of performing basic movements and two fully-articulated, half-figure puppets to be used for closeups. “We decided to go with radio control for the heads because there wouldn’t have been enough room through the thin neck for any kind of cabling system. The heads had to be totally self-contained units. They were mechanized to perform snarl, smile and nose twitch; also, the cheeks moved up and down, the eyes blinked and the eyebrows had two points of movement on each side. The heads also had a mechanized jaw and pulsing bladders to suggest blood flow.”



Bob Short and Doug Turner at work on the alien drone sculpture.

Short paid special attention to the construction of the eyes. “All the abductees agreed that the aliens’ eyes were just black and full of depth — almost like a starfield. I watched *Communion*, *Close Encounters* and anything else I could find, to get an idea of what had been done before. Everybody

seemed to do these black painted orbs for the eyes, which I thought looked plastic. So to achieve some sort of depth, I designed a two-inch-thick clear resin casting which was executed by Don Matheson. The mold was filled with a clear resin three-quarters of the way up; then a mixture of aluminum powder and blue-tinted resin was poured into the rest of the mold. Even though it was a metallic blue, it read as black on film. Then a red fiberglass vein pattern was put into the resin before it set.”

Latex skins were cast by Gil Mosko, then painted by Kathy and Rob Tharpe in the pasty-white color described by the abductees. But again, once on set, the realities of filmmaking overruled the realities of recollection. “The problem with the pasty-white color was that it would pick up any ambient color on the set. If there was a little bit of amber on the gels, for example, the aliens would turn amber. So we went for a medium blue-gray for the base. Then, with a brown color, we created a kind of patchwork, mottling it all over the face, adding yellows and greens and reds to give it more of a human flesh tone. The more human its coloring, the more readable it was on film.”

Six separate alien arms were built to support the full- and half-figure puppets and to perform specific actions required in the script. “Four were just static arms that had wrist movement, with wire fingers so we could bend them into a particular position. We’d use those primarily for grasping. Once a medical instrument, for example, had been picked up, we could wrap the wire fingers around it and hold onto it that way. We had another set of arms for the drone and one for the doctor that had fully articulated fingers for shots of an alien actually picking up things. We also used them for a shot where the alien reaches out to Mare Winningham and grasps her hands together with his. That took one puppeteer per arm to manipulate.” The articulated arms were also instrumental for a scene in which an alien baby is delivered by the alien doctor. “The first shot in that sequence was the waist-up puppet leaning over to grab the baby. A puppeteer’s arms, covered with latex gloves, were used to actually grab for the infant, reaching along the sides of the puppet. That was the only way we could hit our mark precisely. Then it cut to another angle in which we replaced the puppeteer’s hands with the articulated arms. We glued the baby into the hands and completed the scene that way.”

Accustomed to creating characters that are purely creatures of fantasy, Bob Short found the *Intruders* project particularly meaningful — this time he was replicating characters inspired by the experiences of people for whom aliens are only too real. Having had his own close encounter with avowed abductees, Short has emerged from the experience less skeptical than many who dismiss the entire subject as a kind of New Age mythology. “The more you study the subject, the harder it is to ignore,” Short asserted. “Something like one out of fifty Americans has had an experience with a UFO, so I certainly don’t discount it as a bunch of lunatics running around trying to get publicity for themselves. While doing this show people would ask, ‘Wouldn’t you like to get abducted and see what it’s like?’ And my answer was always, ‘No. ’I these things exist, and if they do what the abductees claim, I don’t want to run into them. I hope I’ve gotten as close to aliens as I ever will be.”

LASER REVOLUTION: THE EIGHTH WONDER

article by David C. Fein

It was the film that launched a thousand careers — Willis O'Brien's visual effects masterpiece, *King Kong*. Though remembered best for its extraordinary stop-motion animation, the film also employed some innovative optical effects and both miniature and large-screen rear process photography. With a small cadre of talented technicians, O'Brien filled a primordial South Seas island with prehistoric creatures and transported its principal denizen to the streets of New York for a classic encounter atop The Empire State Building. Unveiled at the height of the Great Depression, the film was a phenomenal boxoffice success, rescuing the near-bankrupt RKO Pictures from certain financial ruin.

When *King Kong* was first released in 1933, all of the prints were taken directly from the original camera negative. This practice was common at the time due to the limited number of prints required for theatrical distribution and the understandable desire to insure the best possible quality. Motion pictures were then considered to have a very limited lifespan, so few measures were taken to protect the source materials from deterioration and damage.

By the time of its 1938 reissue, the original *King Kong* negative had been scratched, spliced and damaged in a variety of ways that have been commuted into almost all of the current forms of the film. Moreover, shortly after the initial release, the filmmakers were urged to remove a number of sequences that were considered unduly gruesome, violent or risqué. Removal of these scenes, oddly enough, shifted the character of the giant ape from a vicious killer to a more sympathetic victim. Social sensibilities have evolved since the 1930s, and these scenes which were once considered objectionable are now recovered gems. In the late 1960s, discovery of *The Missing* sections led to the promotion of a reconstructed theatrical release, making *King Kong* one of the very first restoration projects. However, a serious problem existed — the restored pieces were damaged and did not match the quality of the rest of the picture. Most notable for its deterioration was the refurbished brontosaurus attack scene. Nonetheless, response to the limited theatrical reissue reflected great enthusiasm for the restoration process.

The first laserdisc release of *Kong* was in 1984. Among the first of The Voyager Company's distinguished 'Criterion Collection' of specialized laserdiscs, the title currently carries a \$74.95 list price. Voyager's transfer featured the highest quality image possible at that time. The film was mastered using a print generated from the original camera negative after the 1938 reissue, and was obtained from the Library of Congress. The formerly excised footage was taken from a 16mm print used for the 1960s film restoration. The transfer was assembled with care, and is superior in quality to all prior televised and videotape versions; yet it still appears dark and muddy, with considerable grain and poor contrast. The restored footage is covered with scratches, and is even darker than the rest of the film. The sound quality is slightly muffled, with audio skips at the beginning and end of some of the restored sequences.

Complementing the feature, the Voyager release offers a running audio commentary by film historian Ronald Haver and a supplemental section of photographs and notes that document the

genesis of the production. Also included is O'Brien's brief stop-motion test for *Creation* — the project supplanted by *King Kong*. Most importantly, the Voyager release is the only *Kong* available in CAV format, offering viewers the opportunity for frame-by-frame analysis. Voyager also markets a CLV version of the film at \$39.95 that omits the supplemental materials, but retains the Haver commentary track.

Shortly after the Voyager release, Image Entertainment issued *King Kong* at a lower \$29.95 price, with a slightly higher-quality video transfer and an audio commentary by Paul Mandell. The inserts, however, were restored from the same dark and muddy 16mm source material used by Voyager. Image discontinued the laserdisc when Turner Home Entertainment, a licensee which distributes through Image Entertainment, released their own restored *Kong*.

The Turner version — released in late 1991 as a double feature with *The Son of Kong* — features the best picture quality currently available. The liner notes indicate that Turner digitally remastered the film from a complete, mint-condition 35mm print discovered in Europe. While the once-excised footage appears to have the same scratches as the earlier restored versions, the 35mm source material which was used in place of the 16mm footage does improve the image quality. All of *King Kong* and the beginning of *Son of Kong* are presented in CLV format; the second side of the sequel, however, featuring stop-motion footage of the toddler ape, is presented in CAV. The overall quality of the sequel is acceptable, but not pristine. The combination of *King Kong* and *Son of Kong* in a single package makes the \$49.95 list price quite reasonable.

Recently, two completely independent sources of *Kong* materials were discovered. Both appear to have been struck from the camera negative after the 1933 release and prior to the removal of the excised footage. Since both of these prints were discovered in Europe, one in France and the other in England, it is apparent that intermediate elements for foreign distribution were created near the time of theatrical release. Evidence suggests that all post-1938 reissue prints were timed much darker than the original 1933 release, causing loss of detail in the restorations using these materials. A case in point is the first shot of Times Square early in the picture. Existing transfers of the film impart a nighttime impression; but in the recently discovered material, it is clearly dusk, with cars and people visible on the street. These new materials are virtually pristine and devoid of almost all visible scratches.

With the discovery of these sterling prints, *Kong* should most certainly be retransferred to create a truly definitive laserdisc version of this all-time favorite. And, of course, it should include a complete and carefully detailed supplement — with perhaps an audio commentary by O'Brien's celebrated successor, Ray Harryhausen.

All of the laserdisc releases currently available are worthy attempts at presenting *King Kong* in its full glory. Each has its advantages, but until a truly exemplary version of this classic is created, the clear choice for studying its masterful effects must be the Voyager release. With its specialized supplement, narration track and CAV format, this presentation is the most suitable for examining the craftsmanship that went into the film. Unless viewers have one of the more expensive laserdisc players featuring digital frame advance, the Turner version — even with its superior picture and sound quality — will remain essentially inaccessible to detailed study.

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